TECHNOLOGY DEPARTMENT

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Plant Engineering

IN THIS ISSUE

Safety Crimes 15

Getting a New Freight Elevator. By W. W. Bryant 16

Static Elimination 18

Check Valves — Traffic Cops of the Pipe Lines. By H. J. Bartlett . . 19

Industrial Railroad Crossings. By John Ruedisueli 22

Industrial Doors Are Tools in Your Plant 23

Match or Misfit? The Centrifugal Pump vs Its System. By Roy Carter and I. J. Karassik 26

How to Make Various Stub Connections. By C. Gentilini 28

REGULAR DEPARTMENTS

Letters from the Readers 4

New Products and Methods 6

Questions and Answers 31

Maintenance and Operation 33

Plant Engineers' Digest 36

Bulletins . . . Catalogs 43

Plant Engineers' Library 48

Volume 2, No. 4

The magazine that helps plant engineers with their everyday problems

No. 7-R BEAVER RATCHET—1 to 2 inch

Has these definite Mechanical Advantages

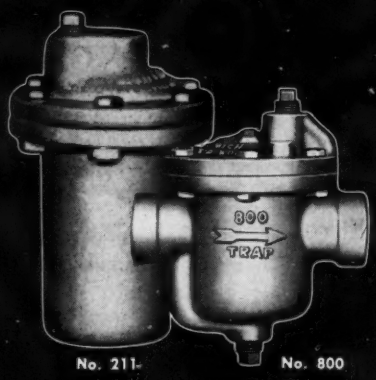
The No. 7-R taper-post ratchet threader uses four sets of dies, one for each size, to thread 1, 1¼, 1½ and 2-inch. Both dies and bushings are standard and interchangeable with other similar makes. Beaver taper post threaders have *definite mechanical advantages*. (a) The ratchet and handle pulls directly on the diehead—not on the light ring which holds the taper post. Beaver "straight-line pull" is a more efficient application of power—and, being easier on the tool, results in less repair expense. (b) Die retaining mechanism is fully-enclosed—no dirt can get back of it. Dies will not fall out due to dirt back of flat springs. (c) The dies are hobbed—and all segments are interchangeable. Any No. 1 segment will replace any other No. 1 segment. This means a lot to users! It is not necessary to return dies to factory to "match" segments.

Write for No. 48 Catalog — Hand Tools — Pipe Machines — Power Units

Highest quality of materials and workmanhsip.

BEAVER PIPE TOOLS

210 DANA AVENUE *Quality Tools—Since 1900* **WARREN, OHIO**



No. 211- No. 800

Above left — Armstrong bottom inlet—top outlet series trap.

Above right — Armstrong No. 800 side inlet—side outlet trap.

PROOF THAT ARMSTRONG TRAPS PAY DIVIDENDS:

DAILY COAL CONSUMPTION REDUCED 5 TONS by using Armstrong traps.—*City High School, Springfield, Ill.*

•

95% MAINTENANCE REDUCTION after using Armstrong traps.—*R. Thomas & Sons Co., Lisbon, Ohio.*

•

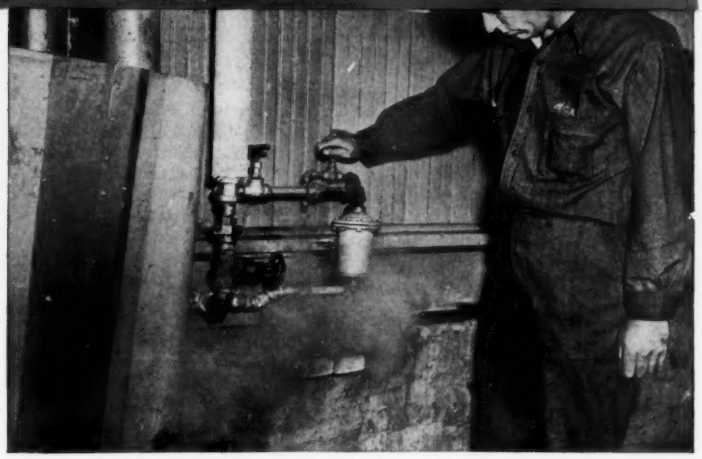
COAL CONSUMPTION CUT 4½ TONS by installing Armstrongs.—*Couch Bros. Mfg. Co., East Point, Ga.*

•

20% MORE PRODUCTION since use of Armstrong traps on kettles and vacuum pumps.—*Mary Lincoln Candy Co., Buffalo, N. Y.*

For Fuel Savings and Maximum Production

INSPECT YOUR STEAM TRAPS REGULARLY



IT WILL PAY YOU handsome dividends in fuel savings and increased production to keep your steam traps in good working order. Inspect them for wear, clean out dirt, check the valves for leakage.*

WORN STEAM TRAPS COST YOU MONEY. Instead of retaining steam in your equipment until it gives up enough heat to condense, worn traps with leaky valves let live steam blow through to the return lines. Much of the heat is wasted instead of being utilized productively. Next time you pay your fuel bill, ask yourself how much heat you can afford to waste. The answer is NONE. Hence you must *repair or replace worn traps.*

GET RID OF THE HORSE AND BUGGY MODELS. Some traps aren't worth repairing. If they require frequent maintenance, if they are large in size and small in capacity, if they don't remove *both* air and condensate as fast as they accumulate, replace them with modern Armstrong steam traps.

The test is: Do they keep your equipment hot without leaking steam and will they do this without frequent and costly maintenance? Armstrong Traps have hardened chrome steel valves and seats and all other working parts are stainless steel, which are suitable for pressures up to 1500 pounds per square inch! That's one reason they seldom need repairs.

IF YOU NEED TRAPS, CONSULT ARMSTRONG. Thousands of satisfied users will testify that Armstrong traps keep machines hotter without wasting fuel and stay on the job longer with less attention.

The ARMSTRONG STEAM TRAP BOOK discusses these features and lists the correct sizes of traps for various services. Send for a copy.

ARMSTRONG MACHINE WORKS
912 Maple Street • Three Rivers, Michigan

*Ask for a copy of the Armstrong Steam Trap Maintenance Bulletin for details on trap inspection and maintenance.

ARMSTRONG *Inverted Bucket* STEAM TRAPS

No. 5 of a series of advertisements devoted to improving efficiency through better trapping.

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Letters from the Readers

This section is for open discussion of: any topic of interest to, or, in the sphere of the plant engineer; pertinent comment on articles published; and suggestions, criticism or commendation. Let the quips fall where they may. Material selected for publication will be paid for and, upon request, name and company connection will be omitted.

Safety First!

MODERN PLANT engineers are well trained in machines, methods and application, but are they trained to protect themselves and their fellow workmen if and when an accident happens?

This discussion is with reference to first aid work. How about giving artificial respiration correctly? Can you use an artery clamp? What treatment would you give for a skull fracture with a hemorrhage? Can you handle yourself in rescue work, fire or gas? Some of these cases can't wait for a doctor.

The writer doesn't pretend to be a doctor or trying to sell some bandages, he is just trying to bring something to light which every plant engineer should consider. The writer contends that every plant engineer should know first aid. Don't just read a few simple directions in a book and let it go at that. First aid takes practice if you want to remember it. Most of the large insurance companies will furnish you a trained man to give instructions. One evening a week for six weeks will make you reasonably proficient if you apply yourself. Such training is something you can't buy and no one can learn it for you. You may save a life some time because you were big enough to learn it. To the companies and corporations we say this: give your men equipment to work with. We hope you may never need to use it, but if and when you should, you'll need it badly. Don't put a 50-cent first aid kit in a plant where 15 to 20 men are working. Encourage your men; it's as much for your benefit as theirs.

Let's Report Accidents

HERE IS a suggestion: Whenever an accident occurs and is brought to the attention of the editors of PLANT ENGINEERING, it should be printed and, if possible acompanied by photographs and sketches.

The writer has always felt that more emphasis should be put on the dangers that lurk in and around plants of every type and size. When these accidents do occur, however few and far between they may be, they frequently take somebody's life with them, to say nothing of the property damage and loss of time and production.

Descriptions of such accidents should be made clear enough so as to bring to light the real danger, the cause and the preventive measure to be taken, in order that somebody else may not make the same mistake. Regardless of how long we may have gone without an accident, or regardless of how careful we may be, the danger is always there. A reminder of the results should be of priceless value.

C. W. P.

Editor's Note: This is a good idea. These pages are for the best use you can make of them.

Flood Lamps Do Heating Job

REPAIRS TO a 50 hp motor that was located within a housing at the bottom of a tower had to be made during a recent cold snap. The failure had occurred in a compound-filled terminal located outside the motor enclosure and mounted on a fabricated support. A temporary canvas tent was arranged to brake the wind somewhat but it still did not stop the intense cold from stiffening the hands of the repair men. It was impossible to wait until better weather as the motor was needed immediately.

Since no heating reflectors were available in the plant we collected all the adjustable flood lamps. Socket adapters were installed with suitable heating elements. The lamps were then focused directly on the terminal and splice and the job finished in time.

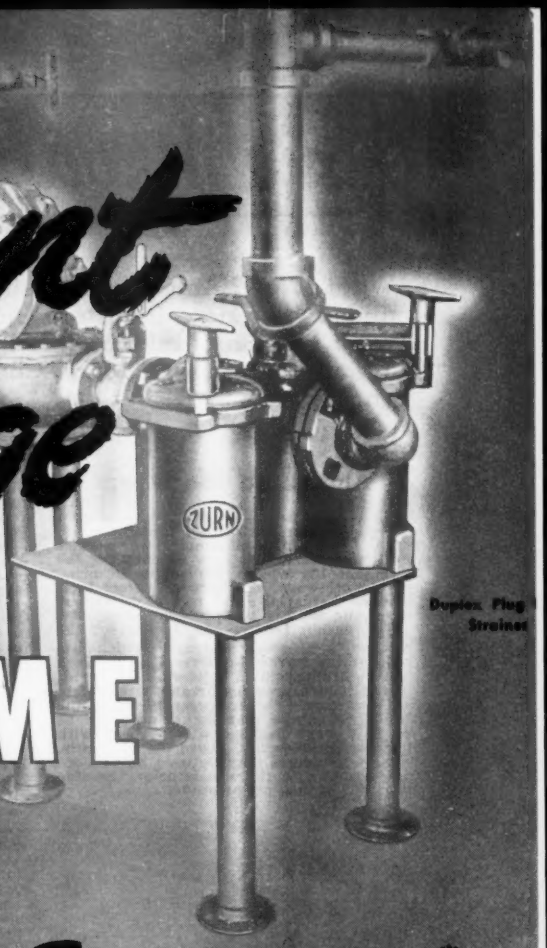
K. B. H.

This issue is somewhat late in reaching you and the printing in some respects is not in accordance with our regular style. These differences are due entirely to temporary production difficulties and we will be back to our regular style and quality as soon as printing conditions in Chicago return to normal...

THE EDITORS

Plant Engineering is published monthly at 53 W. Jackson Blvd., Chicago 4, Ill. Subscription price $10.00 per year to U. S. A., $11.00 to Canada, $12.00 to other countries. Single copy $1.00. Application is pending for acceptance under Act of June 5, 1934.

Sediment Damage



Duplex Plug Strainer

IS MAKING

DOWNTIME

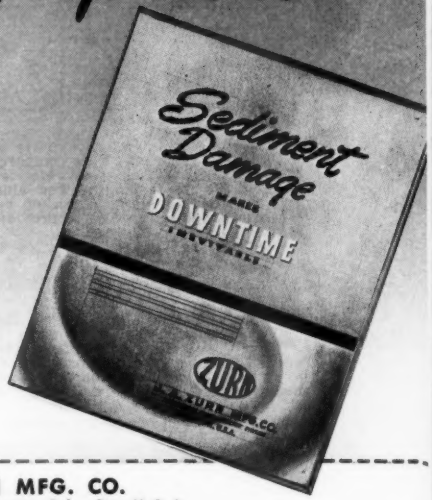
INEVITABLE WHEREVER

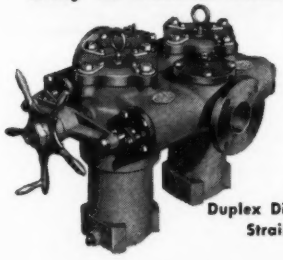
*Fluid Handling Equipment**

IS IN OPERATION

*Fluid Handling Equipment includes all types of Pumps, Valves, Meters, Traps, Regulators, Aspirators, Injectors and other types of control equipment.

Sediment Damage *Downtime* is the effect of uncontrolled sediment! Uncontrolled sediment travels in fluids and remains in the piping system, accumulating at points and within control equipment, eventually and inevitably causing *Downtime*. Sediment Damage is occurring right now—even while you read this message. Its effects are unpredictable! Make-shift methods and practices neither control sediment nor prevent Sediment Damage. The results of a thorough study of this troublesome and costly burden on production are presented in a 24-page booklet especially prepared for top management and plant operating executives. Take the first step in obtaining engineered control of sediment and overcoming *Downtime!* Write for your copy today on business letterhead.




Duplex Disc Type Strainer

ZURN

J. A. ZURN MFG. CO.
Pittsburgh Avenue, Erie, Pa., U. S. A.

Please send me copy of booklet "SEDIMENT DAMAGE MAKES *DOWNTIME* INEVITABLE"

Name ..... *Position* .....
Company .....
Street .....
City ..... *State* .....

48-14

J. A. ZURN MFG. CO. • Industrial Division • Erie, Pa., U.S.A.

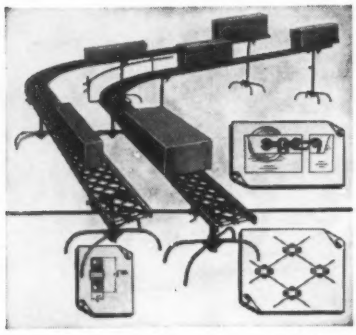
New Products and Methods

What's New? American industrial superiority is based upon doing things easier, faster and better. Here industrial ingenuity is summarized for your quick review. If you want additional information, have questions on specific applications, use the no obligation, no postage, "Mark, Clip and Mail" postcard between pages 10 and 11 and 42 and 43.

Aluminum Loadveyor

1 A new standardized loadveyor made entirely of aluminum, including aluminum wheels has been announced. The only exception is the fact that the wheels retain the hardened inner race-ways, the hardened steel balls and the hardened outer race-ways. Otherwise, the unit is 100 per cent aluminum.

The design follows exactly that of the company's all-steel loadveyor which has been on the market for several years. Each wheel is supported on both sides. The grid-like structure provides greater strength in all directions. The conveyor also has the added advantage that both sides may be used. A large package will be used with the wheels projecting above the side rails. Narrow packages may be used on the opposite side with the wheels below the side rails which then act as guides.



The new aluminum conveyor is only 30 lb. for a 10 ft length. This compares very favorably with the all-steel which weighed 58 lb for a 10 ft length. The aluminum type is made of slightly thicker material than the all-steel in order to provide equal strength. Market Forge Co.

Power Unit

2 This new gas-electric drive is now available to users of the motorized hand-lift trucks. Operating speed of the unit may be adjusted to suit plant working conditions and loads being carried. A simple walking speed control gives three speeds that are entirely independent of th control mechanism of the truck.

Housed in a heavy steel enclosure and powered by a four-cylinder gasoline engine, complete with self starting, this unit weighs 600 lb and requires a space approximately 14 by 24 by 32 in. Leading manufacturers of motorized hand - lift trucks will supply their machines with this drive as original equipment. Or, this new model may be used to convert present battery-operated trucks to this gas-electric drive by making slight alterations to the truck chassis. Ready-Power Co.

High Torque Capacity Motor

3 A new fractional horsepower motor with high torque capacity has just been marketed. Particularly suited for such diverse applications as directional antennae, and innumerable others, the motor at rated voltage has a stalling torque of 75 in.-oz. Small enough to fit in the hand, this new motor is the shaded pole, induction type. With 20 w input at 115 v, 60 cycle a c, the no load speed is 20 rpm on the output shaft. Lower input wattages are available at correspondingly lower stalling torques—with output shaft speed at no load substantially unchanged.

The motor is constructed of aluminum and has a built-in gear train. Various gear ratios can be supplied. Bearings are composed of oil impregnated powdered metal. A particular feature of this motor is its magnetic clutch. With the de-energizing of the motor, this clutch prevents any over-travel of the output shaft. T. C. Smith Mfg. Co.

Masonry Waterproofing

4 Outer walls constructed of concrete blocks, brick or masonry may now be waterproofed successfully with this waterproofing. Designed to prevent moisture from entering the pores of concrete, brick, stone and wood, it is a non-oxidizing mineral gum, reduced with a volatile solvent which evaporates in a short time, leaving the pores of the treated material impervious to moisture.

It penetrates the surface, freeing it from dampness, alkali and efflorescence. In cold climates it protects against disintegration caused by freezing and thawing. Prevents absorption of grease, dirt, soot, discoloration and maintains original finish over long periods. It is easily applied with brush, and may be used clear or mixed with color. One gallon covers 100 sq ft for the recommended two coats. Tufcrete Co.

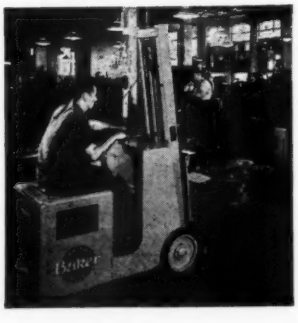
Aluminum Hand Truck

5 A ball-bearing, rubber tired, aluminum hand truck unit in which all parts are interchangeable from a replacement angle by any user in a matter of minutes is now on the market. They weigh approximately 50 per cent less than standard trucks. The standard Freighter Model B designed with a flat top for handling small packages as well as large is suitable for industrial plants and warehouses. A smaller model is available for use on delivery trucks. Unit Manufacturing Co.

Fork Truck

6 This fork truck finds application in all plants where narrow aisles, congested areas, limited floor capacity, small and low capacity elevators are a factor and wherever loads can be limited to 1000 lb. It meets the

(Continued on page 10)



Here is the CMH answer to expansion joint maintenance problems

CMH Controlled-Flexing Expansion Joints

Sizes 4" to 24" Inside Diameters. For Pressures up to 300 p.s.i. Temperatures to 900° F. Copper or Stainless Steel Pressure Carriers. Traverse from 5/16" to 6-3/4". Flanged or Welding ends. Control Rings Corrugation-mated to close working tolerances.

CMH Free-Flexing Expansion Joints

Sizes 4" to 24" Inside Diameters. For Pressures up to 30 p.s.i. Temperatures to 900°F. Copper or Stainless Steel Pressure Carriers. Flanged or Welding Ends.

Once a CMH Expansion Joint is installed you can forget about it. *There are no maintenance problems . . . there is no maintenance expense.* CMH Expansion Joints are FLEXONICALLY* engineered to give years of dependable service in the control of expansion and the correction of piping misalignment. They are compact units requiring a minimum of space.

CMH Engineered Applications take the guesswork out of expansion joint selection . . . your best assurance of getting the right expansion joint for the job. Write today, for complete details and ask for a copy of Expansion Joint Bulletin EJ-47.

"FLEXON" identifies CMH products, which have served industry for more than 45 years.

*the science of FLEXONICS . . ."the controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration and corrosion" . . . is exemplified in the basic products of Chicago Metal Hose Corporation.

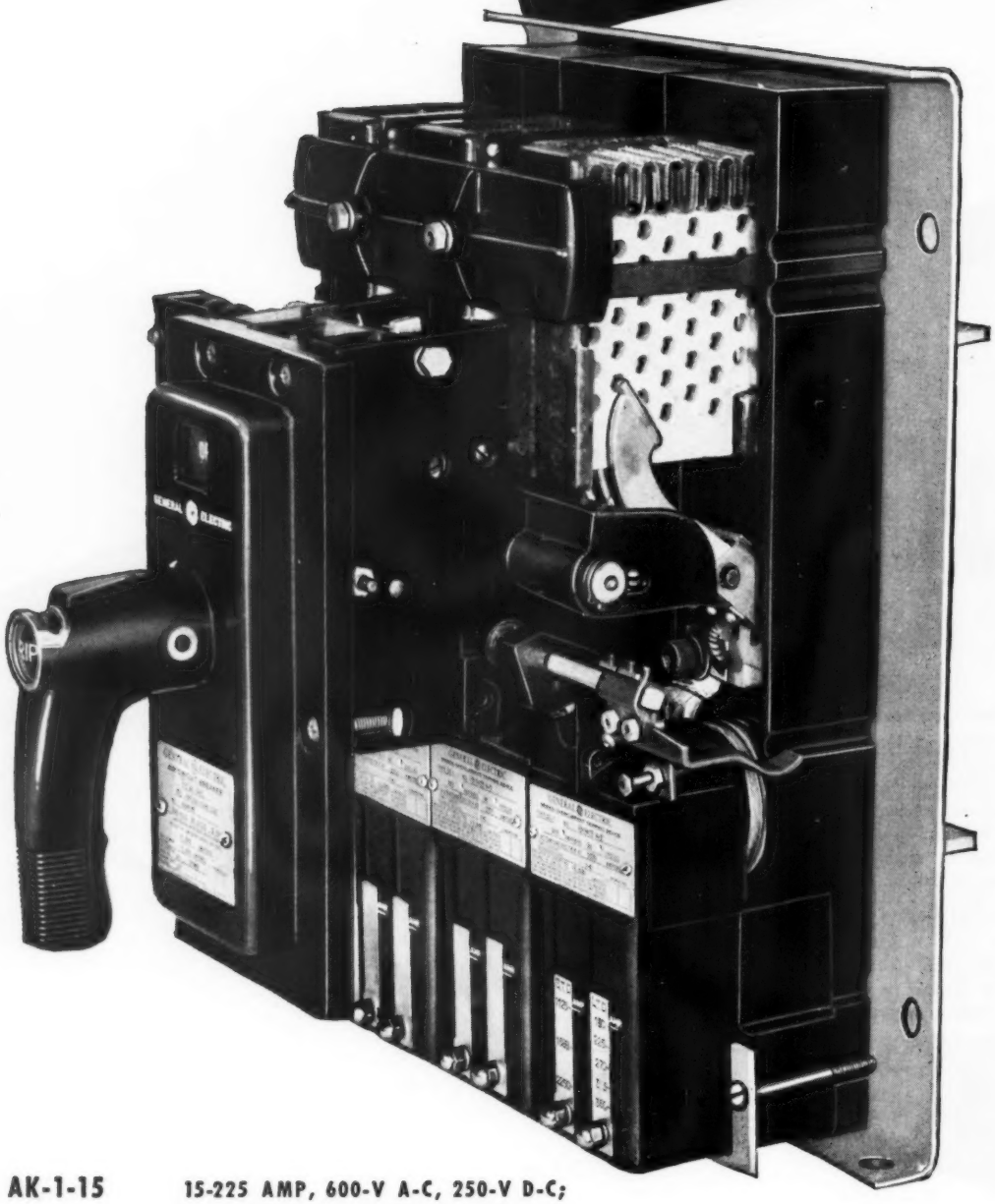
CMH EXPANSION JOINTS

CHICAGO METAL HOSE CORPORATION

Expansion Joint Division • Maywood, Illinois

Plants at Maywood, Elgin and Rock Falls, Illinois

- - - the NEW AK-1



AK-1-15 15-225 AMP, 600-V A-C, 250-V D-C;
15,000-AMP INTERRUPTING RATING

AK-1-25 35-600 AMP, 600-V A-C, 250-V D-C;
25,000-AMP INTERRUPTING RATING

air circuit breaker

FOR MAXIMUM PROTECTION AND OPERATING EFFICIENCIES

You'll find that this new Type AK-1 air circuit breaker for indoor and outdoor service on low-voltage circuits offers you more advantages than any other protective device...

IMPROVED ARC INTERRUPTION... less than one cycle ...decreases short circuit disturbances, means less strain on equipment and cables. Silver-alloy contact tips assure longer tip life, low resistance, and no oxidation or deterioration troubles.

MULTIPLE ARCING CONTACTS make possible—for the first time—a circuit breaker that has a short-time rating equal to its interrupting rating.

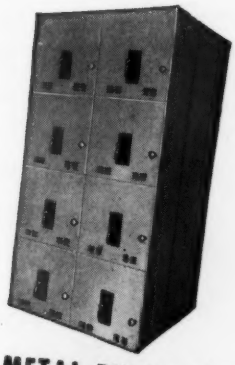
INTERCHANGEABLE TRIP UNITS are "sealed-in," operate in a non-sludging silicone fluid. You can easily install any AK-1 accessory in the field—auxiliary switch, solenoid closing mechanism and control, and shunt trip and undervoltage devices with terminal board. Access is from the front.

SELECTIVE TRIPPING on systems is possible because of adequate momentary rating and the new over-current trip devices. Faults are isolated; will not shut down a "selective system" by tripping the main breaker. Complete selectivity at all currents can be obtained with as many as four AK-s in series.

ALL-METAL BASE provides greater strength . . . Dust-proof, dust-tight, weather-proof, explosion-proof, and water-tight enclosures are available.

YOU GET ADEQUATE "IC" (interrupting capacity) with the new AK-1 breaker for the protection of your production, equipment, and personnel.

Investigate further the many advantages of the Type AK-1 air circuit breaker by contacting your G-E sales representative. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



METAL-ENCLOSED DRAWOUT UNITS

- SMALLER SPACE REQUIRED
- IMPROVED BUS CONSTRUCTION
- NEW RACK-OUT MECHANISM
- EASILY REMOVABLE BREAKERS
- ASK FOR BULLETIN GEA-4966

INDIVIDUAL BREAKERS

- ASK FOR BULLETIN GEA-4951

GENERAL ELECTRIC

New Products and Methods

(Continued from page 6)

needs of small plants that cannot justify the first cost of more expensive equipment, small warehouses, small distributors and many large plants where special conditions exist.

This truck has a 36 in. wheelbase and an overall length, exclusive of forks, of 53⅝ in. To make a right angle turn the truck requires only 67½ in. plus the length of the load, and since the truck is designed for a 1000-lb. load 30 in. long, a right angle turn can be made in 97½ in. The truck is only 28 in. wide. This compact construction permits operation under the conditions described above. Thus, the advantages of power fork truck operation are made available to a large class of users that has been prevented in the past from using the larger type of power industrial truck equipment. It is priced at $2791. Baker-Raulong Co.

Dust-Collector

7 A new type of dust collector has been recently introduced. According to the manufacturer, this dust collector's contribution involves the first commercially successful application of hard-pressed wool felt as a filter

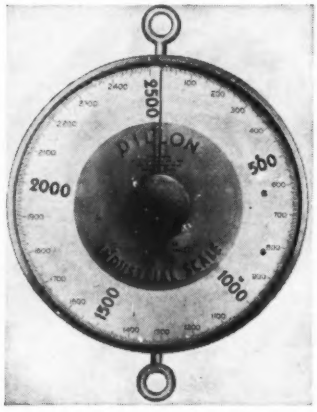
medium in industrial air and gas filtration. The problem of using felt is said to be solved by the use of a hollow, annular blow ring which hugs and flexes the cylindrical felt bag while moving up and down its outer surface by means of conventional chain and sprocket drive.

Around the inner periphery of the blow ring is a narrow slit through which is directed a jet of air supplied by a positive pressure blower. This counter-current of air is conveyed to the blow ring by a flexible hose, assuring a perpetually clean bag. During the filtering operations no portion of the filter surface need be cut off for cleaning or shaking.

Included in the units now in operation are installations for room air-clarification as well as applications involving the use of the collector as an auxiliary to pulverizing and other processes, or materials handling operations. Pulverizing Machinery Co.

Industrial Scale

8 This new industrial scale is designed primarily for heavy duty weighing operations. It indicates the true weight of any object and can be supplied in a top range of 0-10,000 lb. It is ideal for weighing bundles of steel, coils of strip stock, castings, hopper charges, lumber, etc. The scale makes it unnecessary to transport loads from distant points to a central weighing station.



The scale does not depend upon springs. It operates upon the principle of the bending of a beam from a true straight line. The scale permits direct reading without levers or weights to adjust, is not injured by overload. List price is $59.50 F.O.B. Factory. W. C. Dillon & Co., Inc.

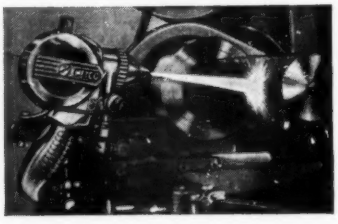
Abrasive Floor Covering

9 This new non-slip abrasive floor covering, compounded of a synthetic resinous material with an evenly dispersed abrasive, reduces razardous slipping and weather wear on all surfaces. This floor coating is completely resistant to water, oil and grease and adheres easily to any type of flat surface. It is ideal for inside or outside loading and unloading platforms, inclines, steps, floors, docks, ramps, aisles, washrooms, basements, and, particularly, factory floors. It provides a stable, working surface for leather shoes or rubber boots.

The coating is easily applied with a brush or a trowel, preferably the latter, in two coats to a depth of approximately ⅛ in.; dries overnight. Finished covering makes floor coating over steel, aluminum, concrete, wood or other materials. Oil-Dri Corp.

Metallizing Gun

10 This new metallizing gun boasts a new turbine construction requiring only one-third the power, making a large compressor unnecessary. The new nozzle construction assures lower cost per pound of metal sprayed because of the low consumption of acetylene and



oxygen. The turbine control feature requires only one adjustment for the entire range of metallizing wires. The gun weighs only 4 lb. 2 oz. These important features offer a metallizing gun that will spray all kinds of metals by hand or machine on all kinds of work. Metallizing Engineering Co., Inc.

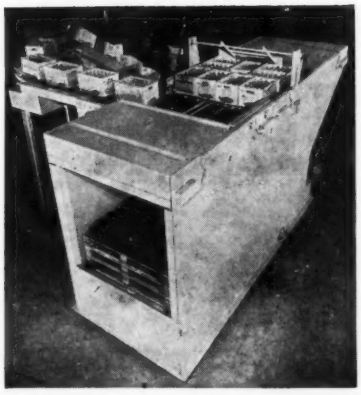
Automatic Pallet Loader

11 A machine of entirely new design for automatically palletizing filled shipping containers has been announced. The machine takes the cases direct from a conveyor line, after they have been sealed, and loads them onto empty pallets, cross-tying them whenever necessary, to make a complete pallet load ready to be picked up by a lift truck for warehousing or shipping.

Packages arriving from the case sealer may come at any speed, since the unit is entirely automatic and completely independent of the conveyor line. If the packages are in excess of the predetermined operating speed of the machine, an accumulator roller, through its swiches, will

INDEX TO NEW PRODUCTS AND METHODS

Item No.		Page	Item No.		Page
1	Aluminum Conveyor	6	20	Protective Coating	12
2	Power Unit	6	21	Hand Power Cutters	12
3	Fractional HP Motor	6	22	Dummy Antenna Resistors	12
4	Masonry Waterproofing	6	23	Annunciator	12
5	Aluminum Hand Truck	6	24	Hard-Surfacing Electrodes	12
6	Ford Truck	6	25	Light Weight Lift Truck	12
7	Dust-Collector	10	26	Package Steam Generators	12
8	Industrial Scale	10	27	Pump Packing	12
9	Abrasive Floor Covering	10	28	Liquid Adhesives	40
10	Metallizing Gun	10	29	Foot Lift Truck	40
11	Automatic Pallet Loader	10	30	Wall Finish	40
12	Pipe Units	11	31	Fork Truck Shovel	41
13	Bar Hangars	11	32	Handy Tool Kit	41
14	Synchronous Inductor Motor	11	33	Two-Station Inter-Com	42
15	Stoker Coal Crusher	11	34	Production Control Device	42
16	Fork Truck Attachment	11	35	Valve Packing	42
17	Battery Charging Unit	11	36	Grease and Oil Remover	42
18	Portable Oil Flusher	11	37	Pressure Switch	43
19	Employee Suggestion Box	12	38	Paint Scraper	45
			39	Drill Jig	46



hold back any excess. If the operator forgets to load empty pallets into the machine, delivery is automatically stopped. The pallet loader is so designed that by the use of a stack pattern electrical control unit, selections of up to 18 stacking arrangements can be obtained by simply pushing a button. The machine can, with this electrical panel cabinet, handle a majority of the standard types of cases manufactured in volume by the average company. Production Aids, Inc.

Pipe Units

12 An outstanding feature of these Foilclad pipe units for overhead distribution of oil, viscous fluids, process liquids and steam, lays in the fact that pine in these units is insulated at the factory to meet individual project specifications. The units are shipped in 21 ft sections, completely pre-fabricated and ready for installation with only one handling required at job site.

In the prefabrication of these units, asbestos, cork or other insulation, as specified, is machine coated with high temperature asphalt and tension wrapped with asphalt-saturated asbestos felt. A second coating of asphalt is followed by a tension wrapping of aluminum or copper foil which forms a perfect bond with the asphalt. Ric-wil Co.

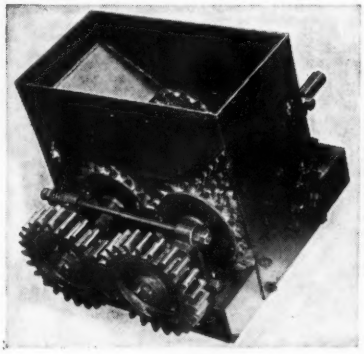
Bar Hangers

13 A new heavy-duty fixture stud for S-type bar hangers, which permits outlet boxes to be easily attached, has been announced. Once the stud has been slipped into the center hold of the box and tightened by a single screw, the outlet box is held firmly in place. The S-type bar hangers come in two sizes —one for spacings between studs or joists up to 16 in., and the other for spacings up to 24 in. Either will fit in a space as narrow as six in. Because the hangers fit between the framing instead of being nailed to the face of the stud plaster cracks or bulges on the finished walls are eliminated. General Electric Co.

Stoker-Coal Crusher

15 An economical means of reducing coal to stoker size is provided by the new stoker-coal crusher. This unit reduces egg and nut coal down to stoker size at the rate of 18 to 25 tons per hour, and requires only 5 to 7½ hp to operate, depending on firmness of coal to be reduced.

Long trouble-free service is imparted to the machine by its wear-resistant alloy semi-steel rolls. The 12 in. diameter by



16 in. rolls operate normally at 250 rpm with the shafts carried in heavy babbitted bearings. A release spring permits the rolls to spread for passing hard foreign material without breaking the crusher.

The hopper has a wide 17 in. by 24 in. opening for easy loading, and baffle plates to distribute the feed evenly to the rolls. Eagle Iron Works.

Fork-Truck Attachment

16 This unique fork-truck attachment permits the handling of all loads without pallets. The attachment works with a simple hydraulic control which actuates grippers that hold the bottom tier; the bottom tier then forming a platform for the entire load.

The use of sponge rubber cushioned gripping pads prevents damage to the load. The attachment is particularly useful in removing bags from freight cars and stacking in warehouse, transporting cartons, moving brick, etc. A brick and tile 4-gripper fork attachments has forks of 24 in. length while the gripper attachment for packages uses 27 in. forks. The Liftall Corp. is the manufacturer. The Hyster Co. is the distributor.

Battery Charging Unit

17 A new motor-driven battery-charging unit designed for charging 6-cell lead-acid, and 10-cell Edison batteries has been announced. Starting, charging, and shut-down are performed automatically by the new unit, which meets all Industrial Truck Association standards for 8 hr charging periods.

The motor-generator set and conrols are contained in a cabinet 34 in. high, 24½ in.

wide, and 12 in. deep. On a sloping top are mounted the timer, ammeter, and control switch for manual or automatic operation. A door in the front opens into a storage cabinet.

Beneath the storage spaces are the mg set and controls, which are ventilated by louvers located in the sides of the steel enclosure. Lifting eyes on either side of the top make the charger easy to handle.

The new unit is assembled and wired by the manufacturer. It can be used on 220, or 400, 3-phase, 60-cycle power supply. General Electric Co.

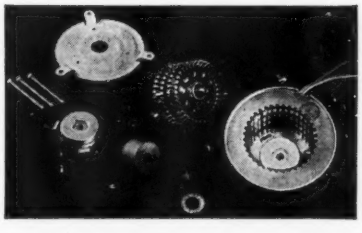
Portable Oil Flusher

18 Internal cleaning of machinery without disessembling by skilled mechanics is now possible through the use of this new portable oil flusher. By means of a high pressure nozzle jet, organic solvents, kerosene or lubricating oil can be shot through the inspection or clean-out openings of housings around bearings, gears or cranks. Thus it is possible to loosen dirt, sludge or wear particles or force out water. Through a safety control device, the flow may be reduced to a gentle flushing stream if desired.

The unit consists of a tank for holding and carrying the flushing fluid to and from the machine to be cleaned; a pump and driver for actuating the fluid; a filter for collecting the refuse cleaned out, and hoses, piping, valves and safety pressure control. It is possible to use the unit as a simple lubricating oil circulating system. Fox River Tool Co.

Alnico Magnet Used in Synchronous Inductor Motor

14 This Alnico 2 permanent magnet provides dc excitation for a self-starting synchronous inductor motor. Alnico permanent magnet is within the rotor structure. Designed to be used in industrial timing devices such as traffic signals, motor operated valves, and recording instruments, the self-starting synchronous inductor motor is essentially an inductor alternator operating as a motor. The rotor torque and inertia are so designed that the motor will start and lock in step with an alternating field in one-half cycle.



One of the unique features of this motor is its extremely rapid acceleration and deceleration. Properly applied the motor is said to come up to speed almost instantly and to stop when the power supply is interrupted. General Electric Co.

New Products and Methods

New Products and Methods

For More Employee Suggestions

19 For securing greater employee response to suggestion systems and improvement plans, an attractive cabinet of modern design is now available. This combines a receptacle for suggestions

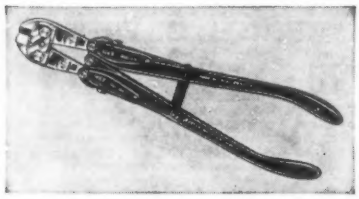
with a rack for blanks and a display space for posters. The unit projects 3¼ in. from the wall and is 15¼ in. high by 21½ in. wide. The frame accommodates posters 9½ by 13 in. Suggestions left by employees are under lock until collected by authorized personnel. Personnel Materials Co.

Protective Coating

20 This new versatile protective coating was designed for use on surfaces which require protection from moisture, acids, alkalis, alcohol, dyes, dirt, dust, etc. It can easily be applied by brush, spray or dip and forms a tough transparent coating which remains permanently flexible and is highly resistant to abuse by either physical or chemical means. The new product is said to resist extremes of heat or cold, will not crack or chip in spite of the expansion or contraction of the surface it protects, imparts a luster to any surface it is applied to and effectively seals in and prolongs the life of ordinary paints, lacquers and varnishes. The new protective liquid is available in one and five gal. cans as well as in 50 gal. steel drums. State Chemical Corp.

Hand Power Cutters

21 In announcing their new redesigned improved complete line of hand power cutters featuring many improvements, the company notes a new degree of ease, strength, safety and performance in the cutting of bolts, rods, wire, cable, chain, bars and metal of all kinds. Of the many improvements these are cited as being of particular benefit to users: curved toe-in handles which decrease armspread and wrist bend making



an easier and stronger pull, broad rounded palm-fit grip which reduces fatigue, no protruding screws or bolts to catch, metal safety handle stop, jaws plainly marked showing capacity and type of metal safety cut, and red color finish. A new folder is offered describing the complete line and recommending the cutter that should be used for each kind of cutting job. H. K. Porter, Inc.

Dummy Antenna Resistors

22 Production of two new series of dummy antennae has been recently announced. The new units consist of a number of special noninductively wound, vitreous-enameled resistors connected in parallel and mounted inside a black wrinkle-finished perforated steel cage. The cage has legs for convenient mounting. To make electrical connections, two types of terminations are provided, depending upon whether the unit is intended to be used in conjunction with a coaxial cable or with a parallel transmission line.

Residual inductance and distributed capacitance have been kept to a minimum making the natural resonant frequency as high as possible. The d-c resistance, residual inductance, the distributed capacitance have been proportioned to give the best possible response characteristics. Ohmite Mfg. Co.

Annunciator

23 This new audible-visual type annunciator is finding applications in power generation and distribution plants as well as in industrial operations. Each annunciator is made up of individual units consisting of main lamp to provide illumination of the translucent designations; an enclosed pilot light and a control relay. Each unit is jack-connected to the circuit and is mounted on a metal slide to facilitate withdrawal from the annunciator cabinet for service, replacement or for any other reason.

Any number of these units may be combined in a single cabinet to meet the requirements of the user. The annunciator shown is made up of 24 units and measures 43 by 20 in. As the designations on this annunciator indicate, this equipment will be used in a boiler room. One of the features of the units is the fact that silencing of the audible alarm for one trouble indication does not prevent the operation of the same alarm in case of additional trouble. The annunciator may be specified for either a c or d c operation, with voltages depending upon requirements. Autocall Co.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11

Hard-Surfacing Electrodes

24 A new group of hard-surfacing electrodes is announced. There are four electrodes in this new series: brown, green, red and yellow. They cover the Rockwell C range of from 35 to 63 (as deposited). A feature of all four of these electrodes in their easy, stable arc. Operators do not have to fight to hold an arc: there is no sputtering or hum. Weld metal flows quietly and smoothly. Cleaning of welds is not required as there is no slag to remove.

With these new electrodes, also introduced is a new method of packaging. Each type is available in specially designed 5-lb moisture-proof tubes having air-tight, screw-on tops. Harnischfeger Corp.

Package Steam Generators

26 A new line of package steam generators up to and including 27,000 lb per hr range, has been announced. The units are assembled at the factory, including refractory and insulation, and are ready to generate steam when delivered and installed. Designs available provide for both oil and gas-firing, and a coal-fired unit will be ready shortly. Two series, low pressure (up to 250 lb) and high pressure (up to 850 lb), are being produced at present.

Basic engineering design provides for installation of super-heaters either as original equipment or for later addition. Combustion controls provide full or semi-automatic operation, as desired, and are an integral part of the "package." Operation of the units from a central control panel is simple. Foster Wheeler Corp.

Pump Packing

27 To overcome the problem of frequently packing pumps that handle hot caustic solutions, a specially prepared packing is offered to industries using this type of solution in their operations. This packing is compounded to resist the damaging effects of harsh caustic solutions even at high temperatures on reciprocating pumps and other similar equipment. It is self-lubricating, assures minimum friction to rods, and prevents costly leaks for high efficency.

Industries confronted with packing problems pertaining to hot caustic solutions such as chemical producers, bottling plants, dairies, wool scouring plants, soap maufacturers will find this packing ideal for long, economical service. Quaker Rubber Corp.

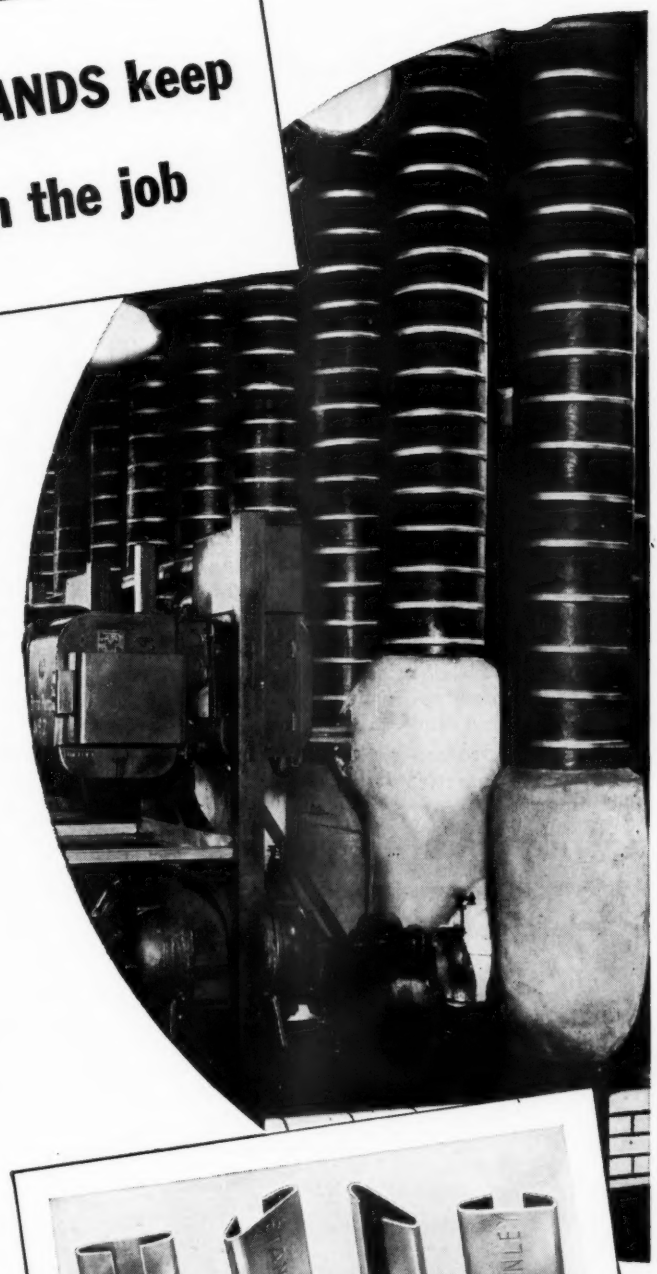
(Continued on page 40)

Light Weight Lift Truck

25 Two new light weight lift-trucks of 1000-lb load capacity or of 2000-lb load capacity have been announced. Containing a Hydroflex clutch, which combines proven clutch mechanical principles with hydraulic control for lift-truck operation and including a one-piece body frame, this lift-truck has been specifically designed for light duty operation.

The width of the truck is 36 in. length (less forks), 70 in., turning radius 61 in., and standard fork length, 30 in. It can travel forward or reverse at 12 mph. Three hand levers control the transmission, hoisting and tilting of the elevating carriage. The Crosley Cobra engine helps give a higher power-weight ratio. The application of planetary gear reduction, actuated with aircraft control cable, to the tricycle principle decreases steering fatigue. Transi-Tier Truck Co.

Now... MONEL BANDS keep pipe insulation on the job



Your plant's pipe insulation may be efficient, but . . . how long will it stay in place?

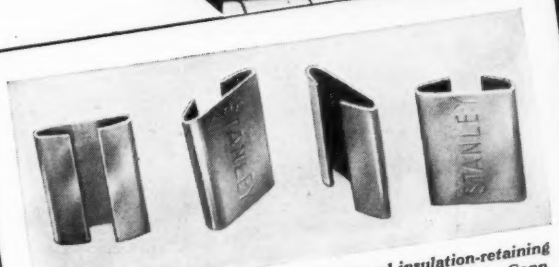
Not long enough — that's too often the answer.

Moisture-saturated atmosphere, corrosive fumes, and extremes of temperature make a combined attack on exposed metal insulation banding. The result is band failure, dropped insulation, and . . . bare pipes.

Plant engineers, tired of continual and costly replacements, turn to Monel* for a solution to this problem. They install Monel bands clamped with Monel strapping seals. The result: indefinitely prolonged band life, and greatly reduced maintenance costs.

Monel—an *INCO* nickel-copper alloy —is a preferred metal wherever *durability* counts. It is stronger than structural steel, corrosion-resistant, and fully rustproof. In addition, it withstands unusual extremes of temperature. Anti-sparking qualities, and but slight magnetic response recommend it for special applications.

If insulation band failure is a problem in your plant why not investigate Monel bands today? It may mean lower repair bills *tomorrow*. For further information, write to *INCO*. *Reg. U. S. Pat. Off.



Monel seals for clamping the ends of Monel insulation-retaining bands, manufactured by The Stanley Works, New Britain, Conn.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N.Y.

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Monel*

SMALL TRAP

BIG *Performance*

Little? Sure. But what a giant's job they do!

That's how men judge Yarway Impulse Steam Traps.

Yarways are well suited for trap service throughout industry. The small size itself is an important feature. They are easy to install, fit in anywhere, require no special supports.

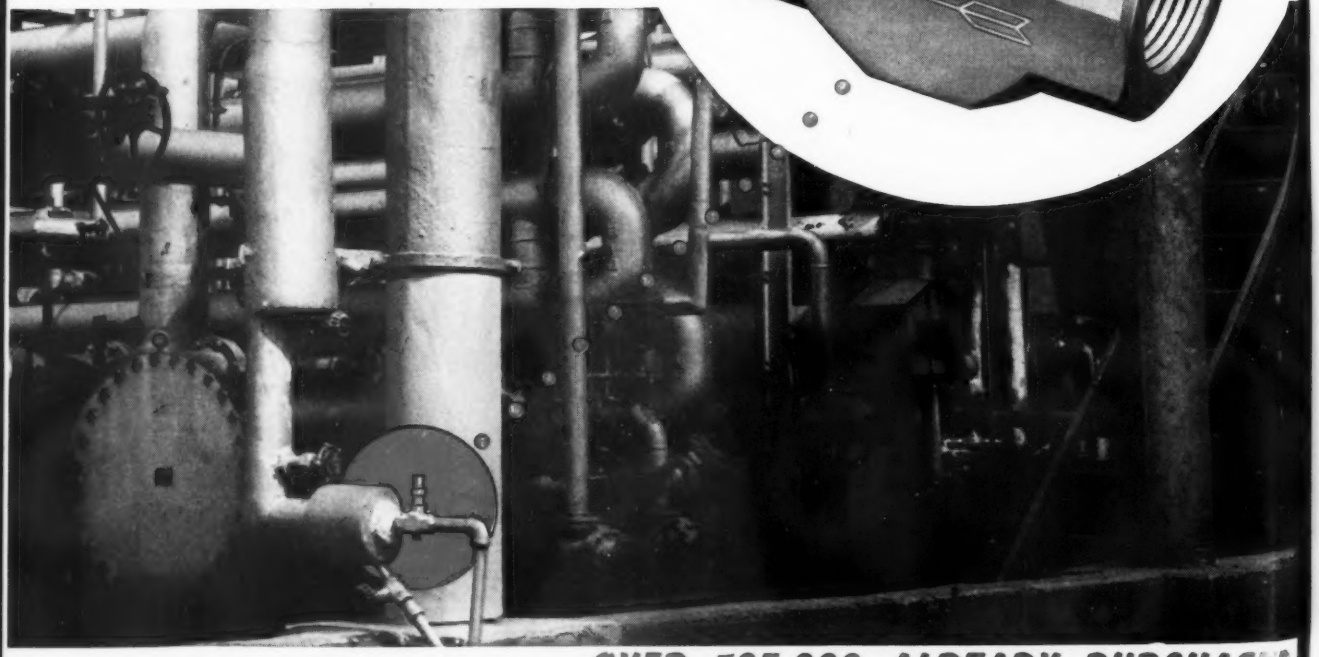
In service they *drink* condensate, discharging *continuously* on heavy loads, at short *intervals* on light loads—providing maximum heat in the shortest time, and keeping equipment at top efficiency.

Yarways are suitable for all pressures without change of valve or seat. Simplicity of construction (only one moving part) minimizes maintenance. Also, initial cost is low.

Try some Yarways today—standardize on them tomorrow. See your nearest Supply House or write for Yarway Bulletin T-1739.

YARNALL-WARING COMPANY

145 Mermaid Avenue, Philadelphia 18, Pa.



OVER 525,000 ALREADY PURCHASED

YARWAY IMPULSE STEAM TRAP

Safety Crimes

Don't daydream on a moving fork truck . . . be alert always.

Truck Operators! Don't commit these safety boners

Safety is mainly a matter of self preservation—taking care of yourself—with a generous mixture of the Golden Rule. In other words, if you take care of yourself and the other man, too, not much of an accidental nature will happen to either of you. So says the *Exide News* in its winter edition and if you don't believe it you might review some of the industrial accidents which have occurred. Accidents do happen, of course, because machines or tools break or materials fail; but such accidents are few when compared with the many accidents caused by human carelessness. In the operation of industrial trucks safety is simply a matter of common sense and simple courtesy. Remember, everbody loses in an accident. Read the rules below—and remember—they don't cover everything.

Check bridge plates frequently . . . be sure they're secure.

Don't "cowboy" your truck . . . repairs are costly . . .

Before starting work, inspect brakes, controls, guards, etc. Report needs for repairs to your foreman.

Do not carry passengers. You need all the room you have to operate and keep control of your work.

Do not allow anyone to operate your truck. They may injure someone, damage the truck or some other piece of equipment.

Take a good look at your load before you pick it up. If load is not properly and safely loaded, don't pick it up; notify the foreman in charge.

Pick up every load squarely and there will be less danger of the load shifting, due to offside loading.

Look before you start. Be sure there is no person or object in the path of your truck.

Carry your load as low as possible when moving. There is less danger of tipping a load at low level.

If operating a truck with a tilting device, use it. This improves the balance and will avoid spilling the load while rounding corners.

Always keep your feet inside guard. It is placed there to protect you.

Observe traffic rules. Keep to the right and obey "stop" and "slow" signals.

Keep in the clear. Travel single file about 20 ft between the trucks and never travel two abreast.

Travel slowly when approaching danger points such as curves, blind corners, oily floors, open pits, elevator gates, railroad tracks, etc.

Blow your horn—But NOT TOO MUCH! Signal when approaching danger spots. Several short blasts are better than one long blast. Blow horn and slow down when approaching pedestrians. Blowing the horn doesn't give you the right of way.

Avoid making quick or jerky stops. The momentum of the load may play tricks on you. Have your truck under control at all times.

Never cut corners. You are in danger of having to stop quickly, losing the load, hurting someone or damaging the materials being carried.

Watch low clearance places. Make sure the height of your load will clear low doorways. DON'T GUESS.

Avoid running over deep holes in the floor or over objects on the floor. This can spin your wheel and cause you to lose control of the truck. Report floor hazards.

Riding on forks is dangerous . . . don't permit it on your truck.

Don't cut corners . . . watch your turns and prevent accidents.

Don't "jam" your brakes . . . skid marks are signs of bad driving.

Never permit unauthorized persons to operate fork trucks.

Sound horns or warning gongs at all blind intersections.

Getting a New Freight Elevator?

By WILLIAM W. BRYANT, *Elevator Div., Westinghouse Elec. Corp.*

FREIGHT elevators, a vital part of a materials handling system in multi-floor factories, warehouses and other types of industrial buildings are important to profitable operations. The plan of this article is to present a few methods which have been found satisfactory in applying standard freight elevators for general use. Also covered are methods of determining budget costs of the types of elevators described.

In order to make an accurate study for determining the freight elevator size, capacity, speed and operation, it is necessary to consider the following points:

1. The building characteristics—including *the travel,* that is the distance between the lowest and highest floors served by the elevator; *the number of floors and the floor heights;* and the floors on which openings on two sides of the car are required. It is also necessary, of course, to review the structural conditions that may influence the size, shape, or location of the elevator.

2. Then consider the units to be carried on the elevator—the weight, the size, the type of unit, and the method of loading. Will they be bulky relatively light packages? Will they be hand truck loads? Will they be power truck loads? Or will they be on pallets or skids loaded by power trucks that do not ride with the loads?

3. The number of units to be handled per hour.

4. The probable cycle of operation and the principal floors served during the peak of the cycle.

5. Will the elevator handle passengers during periods of peak passenger traffic?

All modern elevators are the traction type. Multiple hoist ropes are used and these pass over a driving sheave on the machine—the traction at this point between ropes and driving sheave hoists the car. For speeds at 200 fpm or less, which are generally satisfactory for standard freight elevators, the machines are the geared type. There are two types of control that may be used—the variable voltage type and the a-c rheostatic type.

With variable-voltage type of control the hoisting motor is direct current and there is a motor-generator set provided for each elevator. Regulation, particularly at leveling speed, can be accurately controlled. This type of elevator permits highly accurate stops, rapid acceleration and retardation, and minimum power consumption and maintenance on active elevator. Automatic leveling to compensate for cable stretch or other variations from floor level is an inherent part of the variable voltage equipment. Having the elevator platform always level at the landing being served is, of course, desirable for any type of load or method of loading but where relatively heavy pallet or skid loads are placed in the elevator car with small wheeled power trucks, a smooth threshhold joint is very necessary.

The standard speeds with variable voltage geared freight elevator equipment are 100, 150 and 200 fpm. Seventy-five fpm is also a popular standard for the 10,000 lb. rating. The recommended application of the speeds is as follows: 100 fpm for two or three floors; 150 fpm for four or five floors; and, 200 fpm for six to ten floors. If one of the floors exceeds 20 ft. in height, the next higher speed is desirable. Higher speeds are available when needed.

The a-c rheostatic type of freight elevator equipment is often suitable where the elevator is used infrequently and for that reason it may be considered desirable to limit the investment in the equipment. (By infrequent use we mean an average of less than 5 trips per hour on a normal business day.)

Where the normal landing accuracy of the a-c rheostatic type of equipment may not be adequate for the loading methods expected, then there is a choice of two features—"inching," which may be added to the controller for a single speed a-c motor at nominal cost, permits moving the car to floor level within a limited zone (approx. 9 in. plus or minus) with the doors open. Or automatic leveling, with a two-speed motor and control apparatus, which is available only with selective-collective or single-automatic operation at speeds up to 100 fpm at capacity up to 8000 lb and at 75 fpm at 10,000 lb capacity.

The standard speeds for a-c rheostatic type geared freight elevators are 50, 75 and 100 fpm. Application of speeds is recommended as follows: 50 fpm for two floors; 75 fpm for three or four floors; and, 100 fpm for five to eight floors. If one of the floors extends 20 ft or more in height, the next higher speed is desirable.

Now let us look for a minute at the standard car and door sizes and the capacity ratings, shown in Table I, that may be provided for each size.

The clear inside car width is 4 in. less than the dimensions in Table I. The clear inside car depth, that is the distance from front to back of the car, is 6 in. less when there is an opening at only one end and 8 in. less when there is a opening at both front and rear of the car.

The size of the freight elevator car to be used is generally dependent on the dimensions of the freight package or on the size and number of skids or pallets of material to be carried per trip. Determination of the capacity rating must include consideration of the intended initial use or probable future use of power trucks of the

Table I. This table shows the standard car and door sizes that can be provided for each size of elevator

STANDARD PLATFORM SIZE		STANDARD DOOR SIZE		STANDARD CAPACITY RATING IN POUNDS			
Width	Depth	Width	Height				
5 ft. 4 in.	by 7 ft.	5 ft. 0 in.	by 8 ft.	2500	3000	——	——
6 ft. 4 in.	by 8 ft.	6 ft. 0 in.	by 8 ft.	2500	3000	4000	——
8 ft. 4 in.	by 10 ft.	8 ft. 0 in.	by 8 ft.	4000	5000	6000	8000
8 ft. 4 in.	by 12 ft.	8 ft. 0 in.	by 8 ft.	5000	6000	8000	10000
10 ft. 4 in.	by 14 ft.	10 ft. 0 in.	by 8 ft.	10000	——	——	——

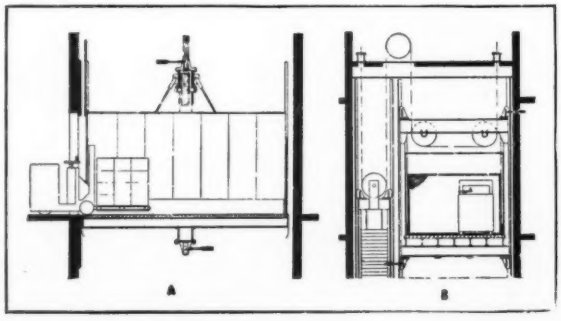


Fig. 1. The power truck with its palletized load just as it enters the elevator concentrates its load on the edge of the platform. The arrows in sketch A indicate the reaction at the guides. Sketch B shows how the load is displaced sidewise

Table II. The minimum passenger ratings for standard freight elevators are shown in this table

CAR SIZE	NET AREA SQ. FT.	PASSENGER RATING	RECOMMENDED RATING
5 ft 4 in. by 7 ft 0 in.	32.5	2,900	3,000
6 ft 4 in. by 8 ft 0 in.	45	4,350	5,000
8 ft 4 in. by 10 ft 0 in.	76	8,400	8,000
8 ft 4 in. by 12 ft 0 in.	92	10,500	10,000
10 ft 4 in. by 14 ft 0 in.	135	16,600	16,000

forked or other type for placing skidded or palletized material on the car. The use of such power trucks imposes severe strain on the entire elevator car structure and the guide rails as shown in Fig. 1.

The carrying capacity per hour of a freight elevator is determined by the capacity or normal load of the elevator and the time required per round trip. The round trip time is made up of the following three elements:

1. The running time, which may be readily calculated using the speed that is chosen with due allowance for accelerating and retarding time and the distance travelled.

2. The time for operation of the car gate and hoistway doors depending on method of operation which may be manual or power, and

3. The loading and unloading time depending on methods. It is recommended that wherever practical a study be made of these operations at a similar elevator.

The most useful and flexible type of operation for use with variable voltage and a-c rheostatic freight elevators is the selective-collective equipment with an annunciator. The car may be operated without an attendant. When so operated, calls registered by the pressing of car or corridor buttons are collected and the car automatically answers the "down" calls as approached (not in the order registered) when moving down and similarly answers the "up" calls when the car is moving up. Means are provided so that when a loader, or other person is in the car he may, by pressing a button in the car, by-pass other corridor calls when the car is loaded, the by-pass feature automatically resetting at the next stop. The elevator attendant, when on duty, has complete control of the car and can run in either direction to answer calls indicated in the annunciator by pressing the corresponding car button. If attendants will never be used, the annunciator feature may be omitted.

A somewhat simpler type of operation is available, the single-automatic type. This is also available for both variable voltage and a-c rheostatic freight elevators for operation without attendant. It is less expensive but has the disadvantage that corridor calls cannot be registered when the car is in motion, nor can the car respond to more than one call at a time. A corridor call that is registered when the car is stopped can be cancelled by a person on the car. Single-automatic equipment will not collect a series of calls as the selective-collective equipment will do if the by-pass is not used.

If an experienced attendant will always operate the elevator the car switch releveling type of operation is a simple inexpensive means of operating a freight elevator having variable manual control. The car will travel in either direction and will stop in response to the movement of the car switch, leveling automatically at each floor where a stop is to be made. A double row target type annunciator to register corridor calls is usually an adequate signal system.

There is also car switch type of operation for freight elevators with a-c rheostatic control. Leveling the car at each landing is done by the attendant to a mark on the door with the normal car switch operating device. A single row target type annunciator is the usual signal system.

The least expensive type of operation is the continuous pressure type. It is available for light service a-c rheostatic elevators. Buttons are installed in the corridor and car, the operation of which will cause the car to move in a selected direction as long as the button is held in. The car will stop when the button is released. This control is not recommended for over 70 ft of travel.

The standard hoistway door is the

Table III. This table can be used in conjunction with Fig. 2. The table shows the amounts which must be added to the prices given in Fig. 2 in order to calculate costs of various type doors

TYPE OF DOOR	FIRST DOOR	EACH ADD'L DOOR
Power operated Front Opening	$2300	$975
Power operated Rear Opening	2175	975
Manually Operated Front or Rear Opening	575	575

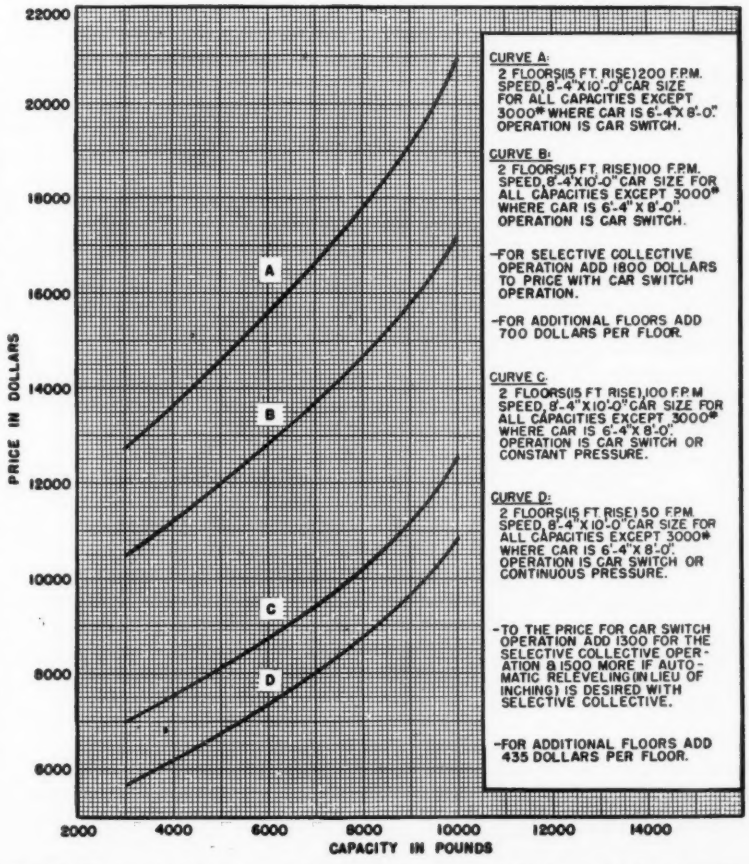

PRICE IN DOLLARS
22000
20000
18000
16000
14000
12000
10000
8000
6000
2000
4000
6000
8000
10000
12000
14000
CAPACITY IN POUNDS
A
B
C
D
CURVE A:
2 FLOORS(15 FT. RISE)200 F.P.M. SPEED, 8'-4"X10'-0" CAR SIZE FOR ALL CAPACITIES EXCEPT 3000# WHERE CAR IS 6'-4"X 8'-0" OPERATION IS CAR SWITCH.
CURVE B:
2 FLOORS(15 FT. RISE)100 F.P.M. SPEED, 8'-4"X10'-0" CAR SIZE FOR ALL CAPACITIES EXCEPT 3000# WHERE CAR IS 6'-4" X 8'-0" OPERATION IS CAR SWITCH.
-FOR SELECTIVE COLLECTIVE OPERATION ADD 1800 DOLLARS TO PRICE WITH CAR SWITCH OPERATION.
-FOR ADDITIONAL FLOORS ADD 700 DOLLARS PER FLOOR.
CURVE C:
2 FLOORS(15 FT. RISE),100 F.P.M. SPEED, 8'-4"X10'-0" CAR SIZE FOR ALL CAPACITIES EXCEPT 3000# WHERE CAR IS 6'-4"X 8'-0". OPERATION IS CAR SWITCH OR CONSTANT PRESSURE.
CURVE D:
2 FLOORS(15 FT. RISE) 50 F.P.M. SPEED, 8'-4"X10'-0" CAR SIZE FOR ALL CAPACITIES EXCEPT 3000# WHERE CAR IS 6'-4"X 8'-0". OPERATION IS CAR SWITCH OR CONTINUOUS PRESSURE.
-TO THE PRICE FOR CAR SWITCH OPERATION ADD 1300 FOR THE SELECTIVE COLLECTIVE OPERATION & 1500 MORE IF AUTOMATIC RELEVELING (IN LIEU OF INCHING) IS DESIRED WITH SELECTIVE COLLECTIVE.
-FOR ADDITIONAL FLOORS ADD 435 DOLLARS PER FLOOR.

Fig. 2. All the elements for use in calculating costs of the types of elevators discussed in the article are contained in this chart

vertical bi-parting metal clad wood door with heavy angle on the top of the lower half of the door to support truck wheels. The doors of all active elevators should be power-operated. All doors wider than eight ft should be power-operated except for some very inactive elevators. The power-operated doors materially improve the efficiency of attendants by reducing fatigue.

Each entrance of a freight elevator car should be protected with a vertical counterbalanced gate which may be wire mesh, expanded metal, or wood. Gate operation may be manual or power-operated to correspond with the hoistway door operation.

Passenger Safety

While the definition of a freight elevator is one which carries only freight and the employees necessary to load or unload the car, most states will grant permission on application for carrying other employees on freight elevators if certain safeguards are provided. The most important safeguards are; first, a capacity rating the same as required for a passenger elevator with the same net area; second, interlocks on hoistway doors instead of locks and contacts and, third, interlocking of the car gate and the counterbalanced hoistway door, so that the hoistway door opens first and the car gate closes first to eliminate the tripping hazard. This third requirement is preferably met by the use of power-operated doors and gates with sequence operation. The door time with sequence operation is the same as for manual doors.

The minimum passenger ratings for the standard freight cars based on net area are shown in Table II.

Where a factory is more than three floors high serious consideration should be given to obtaining approval of using the freight elevator for handling employees during the rush periods. Passenger elevators should be provided for the passenger traffic during the working hours so that passenger traffic will not interfere with freight handling.

In selecting equipment for use on a particular operation, one of the considerations at some point in the analysis is the amount of investment involved. The basic information for calculating budget figures for the standard freight elevator equipment that we have discussed is presented in Fig. 2. Amounts for hoistway doors must be added to the figures given in this chart. Those budget prices on an installed basis are as shown in Table III.

This information on standard apparatus is offered as a guide in the consideration of freight elevators for general use. Other apparatus is available to provide greater capacity, higher speed, or other variation from the normal when required to suit unusual conditions.

Static Elimination

Do you have a problem with static electrical discharges in your plant? . . . Perhaps this new device will help to solve the problem . . . Told here is what one company did to utilize an ionizing device to do away with troublesome static which developed on tomato wrapping machinery

IN PHILADELPHIA, the American Stores Co., one of the largest food chains in the East, had a packaging problem. Fresh tomatoes were attractively packaged in a transparent plastic sheeting. This was fine. It helped sales. But then American learned this sheeting, being airtight, did not permit the tomatoes to breathe, and breathing was necessary.

So two packaging machines at the company's No. 4 warehouse were changed over to another plastic sheeting, similar in appearance but more porous. Then the tomatoes could breathe. But trouble in the form of static electricity reared its head.

The original sheeting in the packaging machines hadn't generated detrimental amounts of static, but the second did, with all the problems of charged machines that give uncomfortable electric shocks to operators, sparking that is a hazard, and sheet-handling difficulties.

Then the trouble was solved by static eliminators, manufactured by the U. S. Radium Corp. These static eliminators involved no electric power use, no wiring, no gas flame, no maintenance costs.

It consists of a shielded bar supporting a strip of radio-active material at the point on the machine where static charges tend to build up. The air at this point is ionized by the alpha rays from the radioactive source, and acts as a conductor to draw off the charges harmlessly as they are generated.

Action of the device is permanent, so far as practical considerations are concerned. Only 50 per cent of its alpha ray generating power is lost in 1600 years.

The installation at American Stores ended the static problems on the two wrapping machines, definitely and completely, according to George Macaw, a superintendent.

Fig. 2. Below: The arrow is pointing to Ionotron, the ionizing equipment as it is installed on the wrapping machine at American Stores in Philadelphia

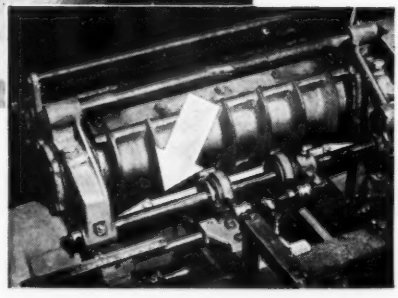
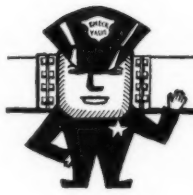


Fig. 1. Above: Here is an overall view of the machine. The circle shows the location of the Ionotron on the wrapping machine in front of the operator



Check Valves —

Traffic Cops of the Pipe Lines

By H. J. BARTLETT, *Crane Co., Chicago*

Check valve use, service and installation . . . Advantages over manual control . . . Severity of service and importance of proper selection for the service involved . . . Types of check valves with general features of construction, application and use . . . A second article will cover details of application and installation

CHECK VALVES are valves designed to permit flow in one direction only, and to close automatically if flow reverses. They are entirely automatic in action, depending upon pressure and velocity of flow within the line to perform their functions of opening and closing.

Few people appreciate the real importance of check valves in a piping system, or the severity of the service to which they are exposed. Whenever a check valve is really needed in a line, it is just about the most important valve in the entire job.

In the first place, it is distinctly a safety first valve. It is used either to prevent dangerous back flow in a line, or, in the case of two or more fluids being supplied to a common point at different pressures and different temperatures, to prevent one fluid from backing up into another line.

Manually operated gate or globe valves could be used to control direction of flow, but instead check valves are used in order to obtain quicker, automatic action and extreme sensitiveness to changes in flow conditions. Thus, a check valve is expected to do more than the gate or globe valve, but it is seldom indeed that users of valves put a fraction of the thought on the selection of the former that they do on the latter.

The fact that check valves are automatic in action renders proper selection even more important. General experience indicates clearly that most automatic valves are subject to great abuse through the tendency of operators to rely on the automatic features performing without any attention.

Since the disc of a check valve in normal service moves with every fluctuation in flow and pressure, it follows that the moving parts of such a valve are subjected to much more severe wear than occurs in a manually operated valve. In the average check valve, this movement of the disc is not limited or cushioned from one end of its travel to the other, so that where severe pulsations of flow take place, *slamming* of the disc at both extremes occurs.

The destructive effect set up is far more severe than anything which occurs in a normal manually operated valve under the same conditions. These factors must be kept in mind if even reasonably good service is to be obtained from these important valves.

Basic Types and Installations

There are only two basic types of check valves, the swing check and the lift check. In the straight swing check design, flow through the body is approximately the same as through a gate valve.

The lift type check valve is also known as the horizontal, and sometimes as the globe type. In this design, bodies of exactly the same design as regular globe and angle valves are commonly used. The disc is free to move in a straight line at right angles to the bridge wall and seat.

There are certain simple fundamental rules which must be followed in installing check valves if proper service is to be received by the user.

Since check valves have no external moving parts which indicate direction of movement of the discs, it is relatively easy to install them backwards if care is not used.

This is particularly true of globe type lift checks which have symmetrical bodies with no visual indication of the position of the bridge wall or the disc. On swing checks, the location of the hinge pin is indicated by the position of the external hinge pin plug, so that only a glance is needed to tell which way the disc swings.

The basic rule covering the installation of all check valves is that they must be applied so that the force of gravity tends to close the valve. The only exception to this rule is the case of the high pressure vertical type ball check valves which may be used in the horizontal position.

Following this rule through, it will be seen that swing check valves can be used in horizontal lines and also for upward flow in any line inclined at any angle up to 90 deg from the horizontal. Lift check valves of the globe type, on the other hand, should only be used in horizontal lines although theoretically they could be used in lines inclined at angles up to 45 deg from the horizontal.

Practically, play in the guides of the ordinary type of globe check

TYPES OF CHECK VALVES, THEIR CONSTRUCTION AND USE

BASIC TYPES

There are only two basic types of check valves, the swing check and the lift check.

In the lift-type check-valve design, bodies of exactly the same design as regular globe and angle valves are commonly used. The disc is free to move in a straight line at right angles to the bridge wall and seating surface. To insure proper seating, the disc is equipped with integral guides above or below the seat or both.

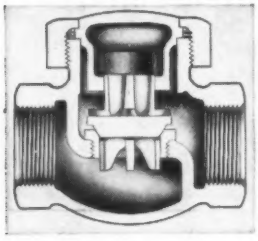


Fig. 1. Lift check valve

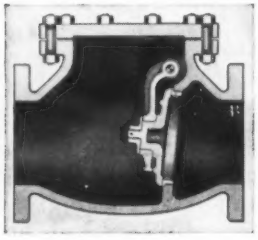


Fig. 2. Swing check valves

These valves are always installed so that the force of gravity holds the disc to its seat when there is no flow through the valve.

In the straight swing check design, flow through the body is approximately the same as through a gate valve. A bridge wall, against which the disc seats, is transposed across the line of flow, and the disc is hinged to a pin placed crosswise of the body above the bridge wall. The disc is free to swing in an arc about this hinge pin, the lower limit of its travel being the bridge wall and the upper some point on the body or cap far enough removed from the bridge wall to insure that full flow can take place. With no pressure or flow through the valve, the disc is held to the seat by gravity.

SWING CHECK VALVES

In the general family of swing check valves, there are a number of designs which merit some individual consideration, such as (1) common straight-way with metal disc, (2) common straight-way with regrindable disc, (3) straight-way with composition or leather disc, (4) angle type, (5) common foot valve, and (6) straight-way with outside lever and weight.

Common Straight-way Check with Metal Disc

Valves of this type have bridge walls with an inclination from the vertical of approximately 10 deg. Since all swing check valves must be installed with the force of gravity tending to hold the disc to the seat, it is obvious that if the bridge wall were exactly vertical, the force holding the disc to the seat with no flow through the valve would be a minimum. Conversely, the force required to start raising the disc from its seat is also a minimum. Actually, such construction is impractical because the small excess amount of power available to hold the disc to the seat renders the disc so sensitive to pulsations in flow

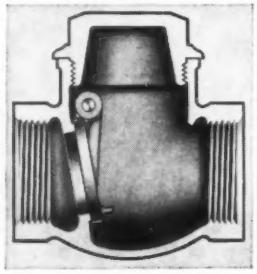


Fig. 3. Straight-way check with one piece disc and hinge

that pounding and leakage are bound to occur.

With the angle of inclination of the seat at about 10 deg, there is sufficient gravitational force present to insure tight seating even on very low pressures. The increased angle of inclination has no appreciable effect on the frictional resistance to flow.

Some check valves of this type have a one-piece disc-and-hinge construction. There is no flexibility in the hinge-disc unit, and, therefore, if the hinge becomes bent through pounding or if slight body distortion takes place, the valve is bound to leak since the disc cannot find its seat. Replacement of the hinge-disc unit in these valves is also something of a problem, since great care must be exercised to insure that the seating surfaces are in proper alignment.

Common Straight-way Check with Regrindable Disc

The term regrinding is applied to those valves in which provision is made for regrinding the disc while the valve is in the line. These valves have bridge walls inclined at 45 deg. from the vertical. The angle is chosen to provide a minimum overall length of body and yet allow for the provision of an opening in the body through

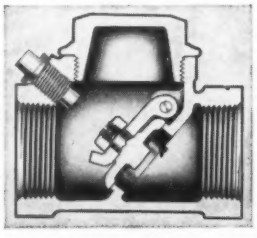


Fig. 4. Straight-way check valve with regrindable disc

which a tool can be inserted to revolve the disc on its seat. The resistance to flow in valves of this type is somewhat greater than in those having a more nearly vertical bridge.

Straight-way Check with Composition or Leather Disc

These valves are similar to regular metal disc valves of the same type, but leather disc valves are intended solely for cold water service. There is a definite advantage in using soft disc valves, particularly where foreign matter may be present in the fluid being handled. On low differentials of pressure, the slightest particle of dirt on the seat of a metal disc check valve will hold the disc off the seat and cause leakage. With a soft disc this possibility is greatly reduced.

Making use of standard composition discs and disc holders of the conventional type in-

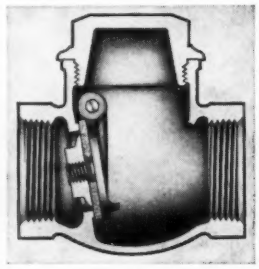


Fig. 5. Straight-way check valve with leather disc

sures that repairs can be quickly made, and at a lower cost than for leather disc valves. As in all composition-disc valves, the seat is protected at the expense of the disc, which results in lower maintenance cost and greater life for the valve.

Common Foot Valves

These have leather discs seating on the bridge wall, but the leather of the disc is extended beyond the seating surface to form an integral hinge which is anchored to the bridge wall. These valves are extremely simple in design, have a minimum number of parts, have no metal-to-metal contacts anywhere in their operating mechanisms, and give excellent service on dirty, gritty water. They cannot be used on hot water or on any fluid which will harden or attack leather.

Straight-way Swing Check with Outside Lever and Weight

This introduces the subject of special features as applied to ordinary swing check valves. In this design the hinge pin is rigidly attached to the hinge and rotates as the disc swings, the external lever moving through the same arc. The lever and weight can be applied to assist the disc in closing, thereby making the valve extremely sensitive to reversal in flow, or to balance the disc,

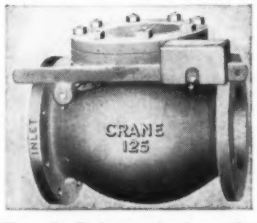


Fig. 6. Swing check valve with outside lever and weight

causing the valve to open under a minimum of pressure. The first construction is widely used where it is desired to have the valve close immediately when forward flow ceases. This construction increases the pressure drop through the valve and adds to the load on the pump.

The second construction is employed when valves are used on extremely low pressures, and particularly where valves are large, involving a very considerable amount of weight in the disc and hinge. Balancing the weight of disc and hinge results in easier operation and less pressure drop through the valve.

LIFT CHECK VALVE

Most lift check valves are definitely companion to globe and angle valves of the same pressure classification. The following classification will be used: (1) straight globe type with metal disc, (2) straight globe type with composition disc, (3) angle type, (4) vertical type, (5) foot valve, (6) ball type, (7) cushioned type, and (8) the stop-check.

Straight Globe Checks with Composition Discs

The merits of composition disc check valves have been rather completely discussed in the section on composition disc swing check valves. Briefly, it may be said that for low pressures and on low differentials of pressure, it is easier to keep seating surfaces tight when soft discs are used. On liquids containing dirt or foreign matter, such valves offer a real advantage. Likewise on low pres-

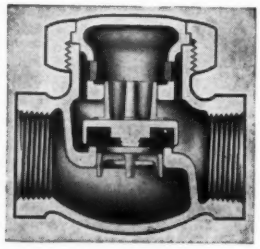


Fig. 7. Globe check valve with composition disc

sure air, or gases and fluids which are hard to hold, composition discs are usually considered to provide tighter seating surfaces than metal discs.

Straight Globe Type with Metal Disc

This classification covers all metal-disc valves, both with and without renewable seats. Valves in this group are of the same general regrinding type, but there is a great variation in individual details of construction. We find screwed caps, union caps and bolted caps, depending on whether the basic globe valve had a screwed bonnet, a union bonnet, or a bolted bonnet.

A similar variation in design of guides for the discs can be found. All of these methods of guiding discs in themselves alone are not sufficiently important to warrant acceptance or rejection of a valve. Accuracy of guiding is far more important than type of guiding.

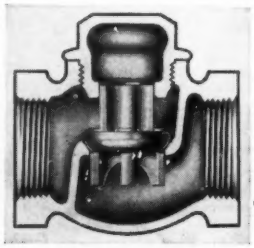


Fig. 8. Globe check valve with metal disc

The power available to seat the disc in any check valve is frequently very low. This

means that unless there is perfect contact between the seat and the disc, leakage occurs. In lift check valves, the disc and its guides are one solid unit. In the regrinding type, beveled seating surfaces are used, which require that the disc be brought to the seat without cocking. Accuracy in guiding is essential in order to insure tightness of seating surfaces under these conditions. Liberal area of grinding surfaces is an additional necessity if accuracy is to be maintained, for wear is accentuated in check valves due to the constant, and sometimes violent, movement of the discs.

Vertical Check Valves

This group is the first type of lift check valve so far considered which is distinctive in body design. They are designed

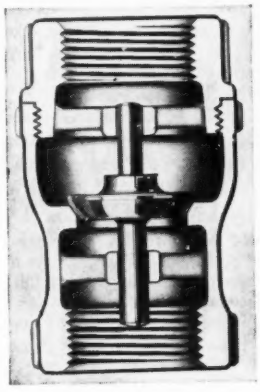


Fig. 9. Vertical check valve

exclusively for upward flow, a service in which they meet competition from swing check valves. They differ from swing checks in that the discs move in a straight line parallel to the flow, and are guided above and below the seats. The bridge wall containing the seating surface is interposed across the line of flow and at right angles to the long axis of the body.

Foot Valves

Foot valves are esentially the same as vertical lift checks. In considering foot valves in general, it should be borne in mind that they are intended only for low-pressure service, since their purpose is merely to keep the suction pipe to a pump full in order to eliminate hand priming of the pump. Absolute tightness of seating surfaces is essential. For that reason, valves with soft discs are usually given the preference.

Construction of foot valves in general is quite light, as they are only intended to withstand a maximum pressure of 15 lb. When centrifugal pumps are used discharging against high heads, foot valves of the lift-check type should be avoided, for there is always the possibility of flow reversing when the pump is shut off, thus building up a pressure far be-

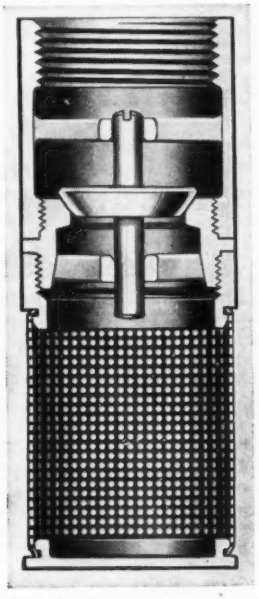


Fig. 10. Foot valve with strainer

yond valve capacity. Use swing check valves if high pressures are likely to occur.

Ball Check Valve

This is a type of lift check in which a ball is substituted for the conventional guided disc. The principal advantage claimed for this design is that the ball never seats in the same position twice. This action tends to keep the seat clean. Likewise, the contact between the ball and its guides is very limited, reducing the possibility of sticking. To assure tight valves it is necessary that the ball be absolutely perfect.

Advancement in the art of manufacturing large size balls of extreme accuracy has been responsible for the development of satisfactory check valves of the ball type. In oil refinery

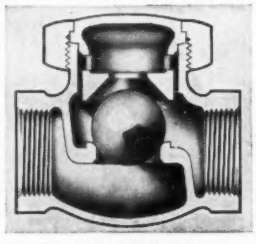


Fig. 11. Ball check valve

service, where fluids are likely to leave gummy or coke-like deposits in valves, the ball check design has acquired considerable popularity because of its apparently better performance.

Cushioned Check Valves

This type is worthy of special consideration. Cushioned check valves are all of the lift type. The upper part of the disc forms a piston operating in an accurately machined cylinder which may be an integral part of the body or a separate liner. The piston and cylinder form an effective dashpot, which cushions the movement of the discs on both the opening and closing stroke and eliminates slamming and pounding.

For severely pulsating flow, the valves with friction rings are recommended because their

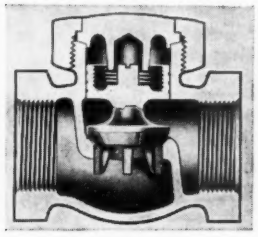


Fig. 12. Cushioned check valve

cushioning effect is more pronounced than in valves with plain pistons. The latter are suitable where pulsations are only moderate in intensity or intermittent. Whenever trouble is being experienced with ordinary types of check valves going to pieces, it is well to remember cushioned valves. They will indefinitely withstand severe conditions under which any other type of valve will not last an even reasonable length of time.

Stop-Check Valves

This classification is a type of lift check in which external mechanical means are provided for seating the disc and holding it closed. In all of these valves, a threaded stem is used which has no mechanical connection with the disc. When the stem is screwed to the upper limit of its travel, the valve acts as an ordinary lift check valve since the stem then does not influence the movement of the disc. When screwed down to the other extreme of its travel, the stem engages the disc and forces it to its seat, and the valve acts as a positive stop valve. By adjusting the stem to some intermediate point in its travel, the upward movement of the disc may be limited and the normal flow through the valve itself controlled. Upon reversal of the flow, the valve will still act as a check valve.

For boiler feed service or any installation where pulsations in flow may be severe, it is considered advisable to insert a spring between the disc and the bonnet in order to prevent slamming of the disc, which might result in battering the end of the stem.

Stop-check valves were primarily designed for service on the steam leads from boilers to headers, but they can be used for many other purposes.

All moving parts operate in a removable liner which contains the seat, so that the entire mechanism can be renewed without taking the valve out of the line. The liner prevents expansion strains and distortion from being transmitted to the internal parts and thus eliminates binding and cramping, which frequently interfere with the free action of ordinary valves. The disc has a long throttling lip which prevents flow from starting through the valve until the disc is a considerable distance above the seat. Pounding, chattering and wire-drawing are thus reduced to a minimum.

When it is desired to eliminate the stop feature, a plain flanged cap can be furnished in place of the usual bonnet, yoke and stem.

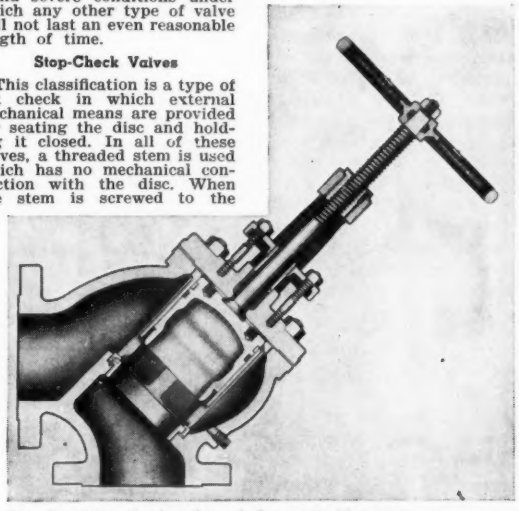


Fig. 13. Stop check valve of the angle Y pattern

valves is sufficient to cause improper seating of the disc if the movement of the disc is varied from a vertical line.

Swing check valves, regardless of the angle of the pipe line in which they are used, should always be installed with the hinge pins in a horizontal position. Since the disc swings in an arc whose plane is at right angles to the axis of the hinge pin, this insures that the disc will always swing in a vertical plane.

There is sufficient play in the component parts of the hinge-disc assembly in swing checks to render imperfect seating likely if the valve is canted over to one side when installed. Wear in the hinge pin and its bearings accentuates this condition and, therefore, in installing or checking the performance of these valves, always be sure that they are properly aligned.

The same remarks as far as alignment is concerned apply to lift check valves.

These valves should always be applied to a pipe line in such a way that the movement of the discs is in a vertical plane.

This is particularly true of lift check valves with metal discs, for here beveled seating surfaces are used which require that the discs be brought to the seats without canting or cocking if tight seating is expected.

Industrial Railroad Crossings

Redesign Cuts Replacement Costs, Saves Wear and Tear on Industrial Trucks

Heavy electric truck loads were tearing shop railroad crossings apart . . . Rough crossings were tearing trucks apart . . . This vicious cycle was halted by redesign of the shop crossings . . . $866 saved per crossing

By JOHN RUEDISUELI, *Shop Engineer, Plant Engineering Dept., Dodge Forge Plant, Division of Chrysler Corp.*

THE PLANT ENGINEERING department of our company had been receiving numerous complaints from all sides regarding the constantly worsening condition of the plant's railroad crossings. Management was complaining that the crossings themselves were getting beyond a repairable condition due to the heavy loads hauled across them by the industrial shop trucks. Then the maintenance section began entering its objections. They complained that the bad condition of the crossings was making it necessary to lay up many of our shop trucks due to the beating they were constantly taking from these crossings.

In reviewing the case we found that previously, unless the crossings were replaced every 3 yr, they became so rutted and distorted that it was next to impossible to use them for traffic. If this did not occur they would loosen and it would be a major undertaking to keep them in place. Both these conditions were caused by the heavy loads of billets and forgings constantly hauled across them on the small (6 in. dia) wheels of the electric shop trucks.

Our plant engineer assigned me the job of correcting and eliminating this hazard. It was my responsibility to see that the life expectancy of the crossings was increased, and, if possible, to cut down the high cost of replacement.

After considerable study and planning a solution was found. The final design of the crossings actually was then very simple. At the bottom was placed a ballast of 6 in. of crushed stone. On top of this ballast was poured a 16 in. slab of 3000 lb concrete reinforced with ⅝ in. round rods on 12 in. centers, running both ways. Embedded in this concrete, flush with the top surface of the concrete, as shown in the drawing, were 6 in. I beams placed on 18 in. centers. Previously we had used 6 in. by 8 in. by 8 ft-0 in. treated oak ties.

Before pouring the 16 in. slab of concrete, the two live railroad rails were fastened to the 6 in. I beams by rail clamps which were welded to the I beams.

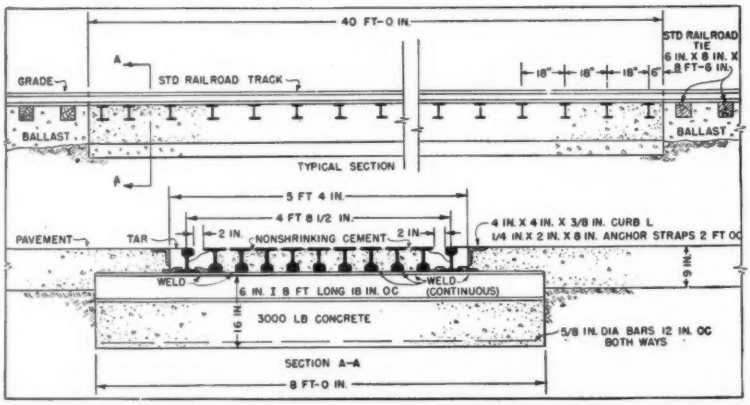
When the slab of concrete had set up sufficiently, 8 or 9 scrap rails of the same weight and size as the live rails, were put in position running parallel to the live rails and almost completely filling the space between the live rails. These scrap rails were set in upside down so that the flat bottom surface of the rails would form a level platform or surface for the passage of the electric trucks. (See Section A-A). They were then welded in place with a continuous weld along the top surfaces of the exposed I beams.

When all the welding had been completed the spaces between the upside-down rails were filled with a non-shrinking cement. The crossings have now been in service for nearly a year and no signs of wear can be detected. If, eventually, the non-shrinking cement does chip out between the rails the largest opening or hole would be 1⅛ in—the space between the upside-down rails. This small crack could not do any damage even to the small wheels on our electric trucks.

During the past ten months, nine of these crossings have been installed at our plant and we are proposing to install seven more in the near future.

The last one of the 30 ft wooden tie railroad crossings was constructed at a cost of $523.00. This was in August 1943. The low bid for the same type of crossing, submitted in August, 1946, was $1,226.00, with our company, the Chrysler Corp., furnishing the steel. It is a safe estimate that our new crossings will outlast the former type by 4 to 1, with a resultant savings of $866.00 per crossing over a 12-yr period. The savings in repairs to our electric trucks during this same period is not figured in this amount but it is quite a sum.

This article was submitted in the 1947 Design for Progress competition sponsored by the James T. Lincoln Arc Welding Foundation.



The top drawing shows a longitudinal section through one of the railroad crossings. The 6 in. I beams were used as ties and were placed on 18 in. centers. The bottom drawing, Section A-A, shows the manner in which the ballast, concrete slab, old rails and cement were used in the redesigned crossing

INDUSTRIAL DOORS
Are Tools in Your Plant

Doors are more than a means of getting into and out of your plant . . . They are production tools, materials handling equipment, fire, burglar and riot protection . . . They hold down major expenses of heat, labor

THE INDUSTRIAL doors in every plant are tools for production. Furthermore, they are materials handling equipment. They are a means for reducing fire hazards and insurance policies. They are protection against weather and unwelcome intruders. A well-fitted, smoothly-closing modern industrial door is the best means of keeping heat costs down in the winter time and air conditioning costs at a minimum in the summer.

A bottleneck conveyor line is intolerable but many a plant puts up with bottleneck doors. Doors are a vital link in the production line. The "aliveness" of any building can be measured in direct ratio to the speed and smoothness of operation of its doors. The design, selection, installation and care of doors should receive as much careful thought and planning as that given to other fine pieces of equipment in the plant.

With labor cost the greatest single item in any company budget it is essential to save the workers' time. Remote control, from any convenient station or from industrial and highway trucks, saves the time of going to and from the door or delegating one man exclusively to that job. Modern doors also increase the margin of plant safety. Because of the ease of raising and lowering the door there is little temptation to leave the door open rather than go through the exertion of closing it. This is especially true when the operator knows that it may be used again in a few minutes.

High cost of fuel is an extremely important item, too, in plant expenditures. Every time a door is opened in winter several fuel dollars fly through the opening. A motor-operated or smoothly operating manually-closed door shortens the period of loss during each opening-closing cycle and, because it is not left open unnecessarily, it not only saves heating dollars but also enables the heating system to maintain a more even and comfortable temperature in the building.

Many special types of doors are available, either from stock or on order. Doors are available for fire stops, either between rooms on the same floor; in stairways and stairwells where dangerous drafts might be created; or on elevator openings which may also permit drafts and allow the flames to spread.

Other types of doors are specially designed to permit passage of cranes or monorails or other types of conveying equipment. Structural problems must be solved here because many times conventional supports must be omitted in order to allow free movement of the carrying devices. Remote control door openers have helped solve certain vexing problems where speed of delivery or often-repeated cycles of opening-closing take place. This type of control allows the truck operator to open the door without leaving the vehicle. This type is shown and described later in the article.

(Continued on Next Page)

Fires Stop Here!

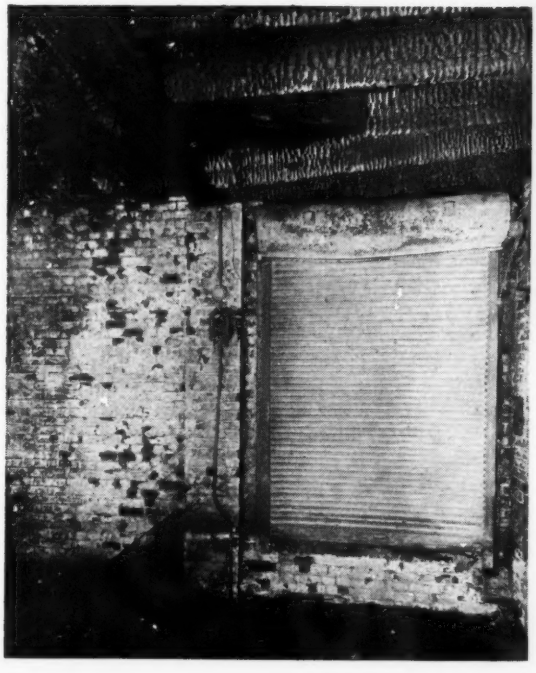


Fig. 1. Left: The type of door shown at the left may be used in any location subject to fire hazard. It is particularly adaptable, however, to buildings housing people—workers, patients, pupils. A safety device or governor controls the downward travel of the door in automatic closure thus eliminating the element of accidental damage

Fig. 2. Above: No extensive alteration of elevator or shaft was required at Warner Swasey's Cleveland plant when these metal, fireproof, power-operated doors were installed. Freight handling on the elevator had to be speeded up and the shaft fireproofed. The two problems were solved by designing special equipment to fit into a recess built into the brick shaft wall. One door not yet installed in this photograph

Special Problems Solved By . . .

PROPER engineering and careful study of existing conditions and desirable changes can make doors doubly useful. In the photographs below are shown several examples of ingenuity on the part of the manufacturers of doors. The problem illustrated in Fig. 3 was to install an overhead door in a 14 by 18 ft. opening in order to admit rail cars for loading and still permit the use of overhead traveling crane when door was either in open or closed position.

When the position of the door and the trucks had been carefully calculated it still was necessary to counterbalance effectively. The weight was too great for the standard multiple torsion springs so 4 in. by 6 in. counterweights were used. The attachment of the counterweights was made and controlled by running over sprockets; these sprockets, in turn, were controlled by the elcetric operator.

The photo in Fig. 4 shows an exceptionally large and unusual crane door installation made on a building in a United States Navy yard. Heat loss through the large openings had to be cut to a minimum and the doors had to be individually motorized so that they could be operated independently and inter-dependently.

The problem which was solved as shown in Fig. 5 was occasioned by the necessity of passing loaded monorail conveyors through the doors.

Another problem, not illustrated, consisted of replacing an existing door which was not giving satisfactory service. In order to eliminate the necessity of altering and modifying the existing structure and to keep present steam and utility lines intact the door was mounted entirely on the outside of the building. It is entirely self-supporting being held by a few anchor bolts.

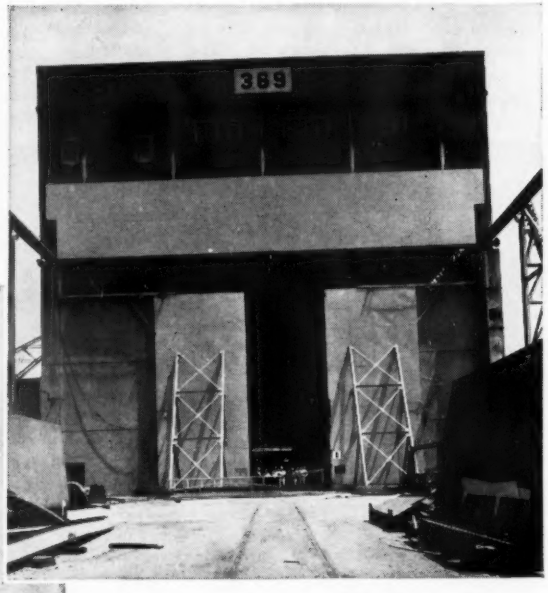
Photo Credit

Figs. 1 and 9 were supplied by The Kinnear Mfg. Co.; Fig. 2 by the Security Fire Door Co.; Figs. 3, 6 and 7 by Barber-Colman Co.; Figs. 4 and 5 by The Fleming Steel Co. and Fig. 8 by The Avco Mfg. Co. PLANT ENGINEERING wishes to acknowledge the assistance given by these and other manufacturers in the preparation of this article.

. . . Special Applications

Fig. 3. Left: The first problem, mentioned above, was solved by mounting vertical track brackets on each side of the opening carrying up to approximately 6 ft above the door opening. Here the door tracks were tailored to curve the door movement over the path of the traveling crane and away from header sufficiently to clear the electric door operator

Fig. 4. Below: The crane leaf, shown in process of being raised, rises vertically on the guides attached to the outside of the building. When this leaf is raised the crane is free to travel from the building out into the yard. The two horizontal moving leaves travel on ground rails and permit the entry and exit of crane loads and railroad cars



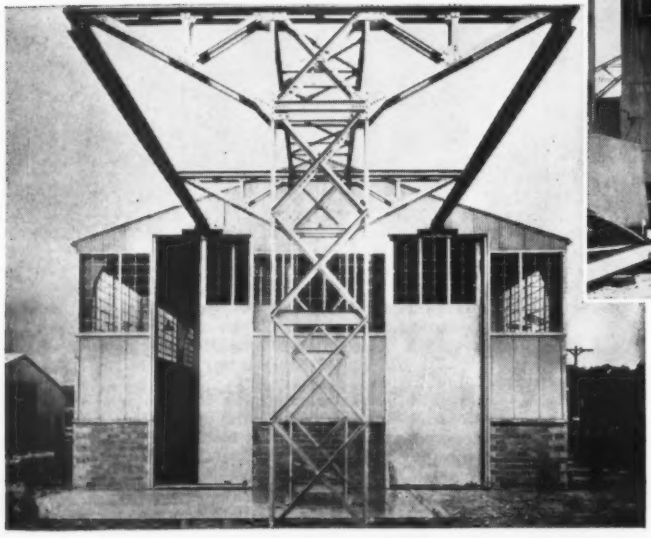
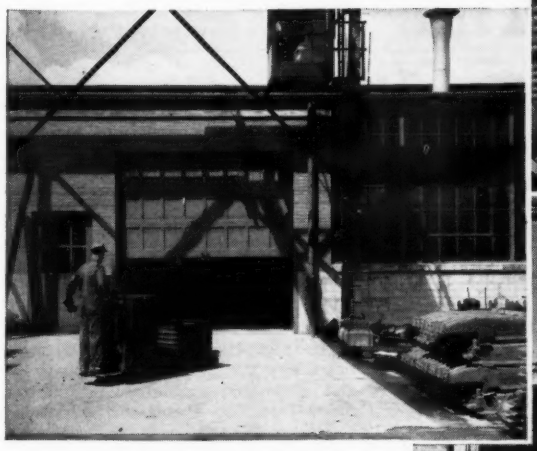


Fig. 5. Left: These two individual slide leaves, each 12 ft by 30 ft, operate independently and they slide inward in such a fashion that they permit a heavy-duty monorail load to pass back and forth from the building to the railroad siding for loading and unloading operations. The doors illustrated are of all-steel construction, fully weathered to conserve heat in the building. Construction is such that they will withstand heavy industrial usage with a minimum amount of maintenance

Door Controls . . .



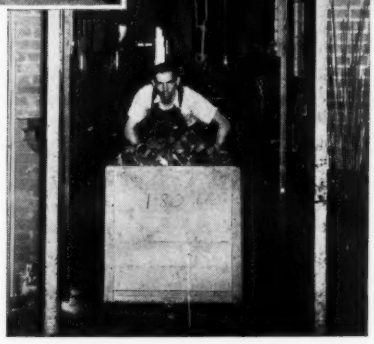


Fig. 6. Above: The operator of this industrial truck is automatically opening the overhead door by means of a radio control. This type of door can be operated either manually or by pushbutton. The auxiliary control is composed of a transmitting and a receiving set. The transmitting set consists of a push button on the truck, a transmitter and coil: the receiving set is recessed flush with the floor

Fig. 7. Right: Where heavy inter-department traffic in plants involves passing through normally closed doors this type of electric operator equipped with ratchet relay control are highly suitable for maximum operating efficiency

Fig. 8. Above: The industrial door opener illustrated here is simple in design and construction. The control is provided with a 3-button switch—open, close and stop. It can also be manually stopped in any position either by opening or closing the circuit without completing the cycle, if so desired. A limit switch is located at each end of the operator which automatically stops the door in the open and closed position. Another feature of the control is that the door is automatically locked when closed and can not be opened from outside

DOOR operators and controls must be reliable and smooth-working. When used in conjunction with modern doors the combination makes for speeded-up operations and increased plant safety. The radio control shown in Fig. 6 is actuated by a transmitting coil mounted on the underside of the truck platform. When the truck passes over the receiver, which is recessed flush with the floor, and the control button on the truck is pressed, a low magnitude alternating current is induced in the pickup coil. This signal from the truck causes the armature in the receiver to vibrate and strike a contact. This actuates the mechanical door operator and opens the door.

The type of control shown in Fig. 7 is specially convenient and time-saving when frequent passage is necessary through doors which must be kept closed when not actually in use. Because the workers can control the door conveniently and independently from either side of the door there is a maximum saving in time and labor. If the door is in mid-stroke when either cord is pulled it will immediately go back to the position from which it started.

Around a Corner

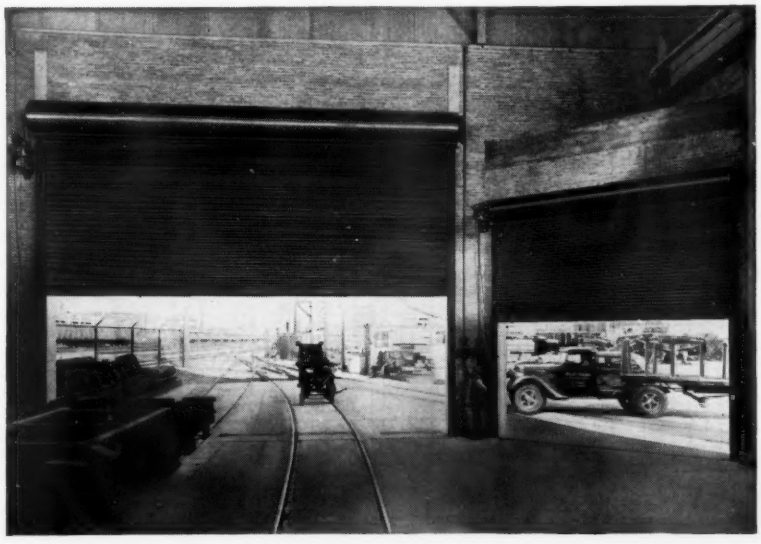


Fig. 9. Rolling doors many times are the most logical or only solution to certain problems posed by peculiarities of building construction or by layout made necessary by conditions of the plant layout. The two doors shown in this photograph permitted this statement to be proved in an actual installation. Other installations have been made in which auxiliary equipment automatically closed the door in case of fire. Some of the steel rolling doors engineered and installed by this company have been put on power houses and grain elevators. These doors are controlled and operated by bracket or wall-mounted electric operators. The wall-mounted operators are used for handling the larger type doors—doors exceeding 18 ft in height or 20 ft in width (or 210 sq ft). Special adaptations provide for conditions where obstructions or limited clearances prevent mounting in the conventional manner.

Match or Misfit? The Centrifugal Pump vs Its System

Part II. Pump selection for variable static . . . Capacity delivered to the system in terms of static head . . . Capacity of pipe lines operating in parallel . . . Pumps for nearly constant delivery over a wide range of capacity . . . Divided flow systems . . . Combined flow systems

By ROY CARTER AND I. J. KARASSIK
Application Engineers, Worthington Pump & Mach. Corp.

AT CONSTANT SPEED the head developed by a centrifugal pump varies with the capacity delivered. If the pump is to be used in a system in which there is a variation in static head, a variation in the capacity delivered thru the system will result. Frequently, when buying a pump for such an installation, a purchaser will calculate the friction at rated capacity, add it to the average static head and state that as the design head. In addition he will add the same friction head to the maximum and minimum static heads and give the resulting heads as the maximum and minimum operating heads that the pump will encounter in service.

This neglects the change in friction with change in capacity and unnecessarily handicaps the manufacturer in selecting a suitable pump for the service. For example, in the installation shown in Fig. 9 some purchasers would specify that the pump had to operate over a head range of 65 to 95 ft giving rated capacity of 250 gpm at 80 ft head. Thus the pump whose characteristic is shown on Fig. 9 would have seemed to be unsatisfactory while actually it will deliver 79 per cent rated capacity at the maximum static head.

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It is often advantageous to know what capacity will be delivered by a pump operating on a system as shown in Fig. 9 in terms of static head. Naturally for any capacity this will be the total head of the pump minus the friction loss at that capacity. This can be plotted as shown by the dotted curve in Fig. 9 and shows, for example, that the flow to the tank will be 244 gpm when the static head is 57 ft.

Very often in the case of a plant or community located some distance from its source of water supply, the demand for water increases over a period of time and it becomes uneconomical to continue to use the existing pipe line, because of the frictional head loss with the increased capacity. If the original line is in good condition, the usual solution is to install a second line of such a size that, in parallel with the existing line, will allow the economical pumpage of the desired increased rated capacity. In such a case with two pipes operating in parallel, the flow thru each branch must be such that the friction head loss thru both is the same.

The proper approach to this prob-is to plot the capacity vs friction head loss for each line and then get the combined capacity vs friction head loss for the two by adding together the capacity of each line at a number of points of equal head losses. For example, on Fig. 10 there is indicated the head loss for a 10 in. line and the head loss for a paralleling 12 in. line.

With 20 ft friction head loss, the 10 in. line will have a flow of 1000 gpm while for the same loss in the 12 in. line the flow will be 1615 gpm. Thus 1000 plus 1615 or 2615 gpm will be the combined flow of the two lines with 20 ft head loss. Similarly the capacity for the two lines in parallel for equal head losses can be determined for a number of points and a curve showing combined capacity vs head loss can be drawn as shown in Fig. 10.

In some systems, like a water works distribution system, it is desired to maintain a nearly constant pressure altho the demand varies. To maintain an exactly constant pressure it would be necessary to vary the speed of the pump or pumps. It is rarely necessary to maintain the pressure exactly and some variation can be allowed.

Most electric motor driven pumps for this service are therefore driven by constant speed electric motors with the result that the pressure will be dependent upon the head developed

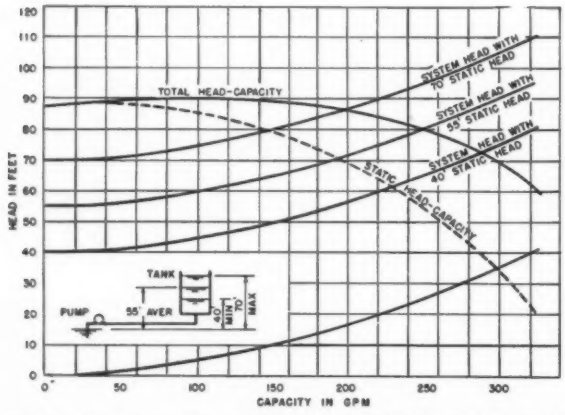

Fig. 9. When selecting a pump for a variable static head friction head variation with capacity must not be neglected

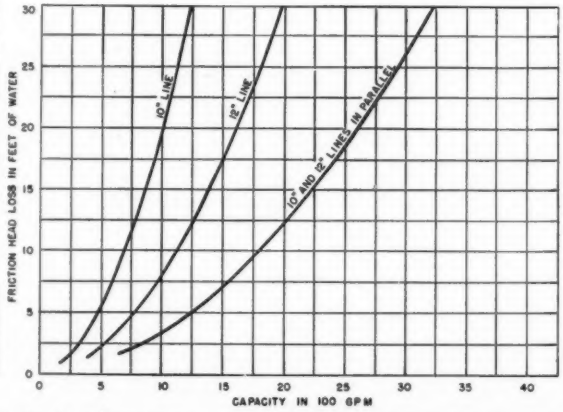

Fig 10. Showing proper method of calculating the capacity vs friction head for two pipelines operating in parallel

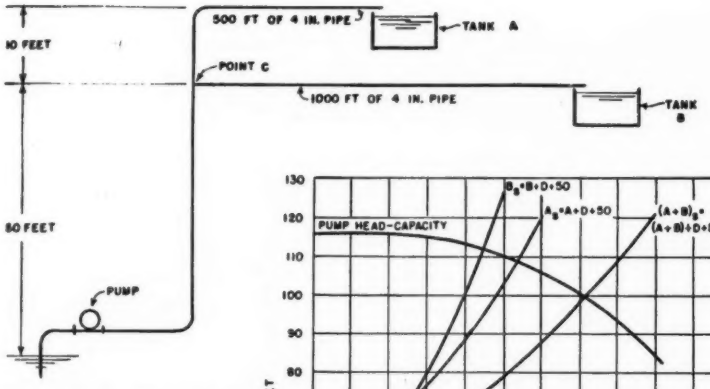

Fig. 11. Above: Diagramatic representation of a pumping system with two branches and uncontrolled flow. The problem is to proportion the pipe and select the pump so that there will be delivery to both tanks

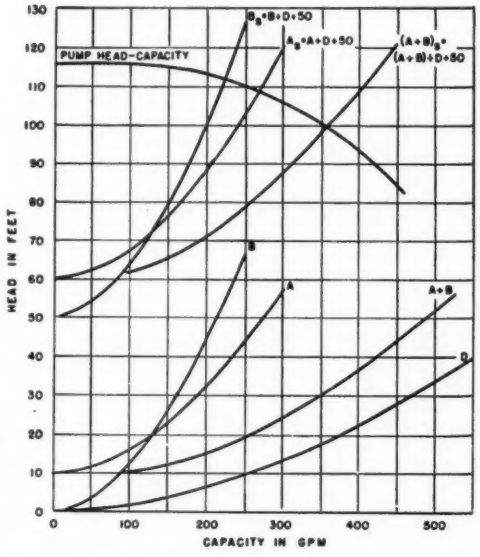

Fig. 12. Right: Solution of the problem presented by the layout shown by Fig. 11. At a pump delivery of 358 gpm, approximately 193 gpm would go to Tank A and 165 gpm to Tank B

by the pump or pumps operating in parallel at the demand capacity. To produce a reasonable constant pressure for the full range of demand, pumps with head-capacity curves which have a shut off head 10 to 20 per cent more than the head at design capacity are best for such services.

Installation of divided flow or branch lines, where the flow is not controlled except to prevent overflowing of a tank or reservoir, usually involve two or possibly three branches. In case of the installation shown in Fig. 11, it is obvious that no flow will go to Tank A unless the friction head loss in the 4 in. line from point C to Tank B exceeds 10 ft, the difference in static head for the two inlets. Considering Branch B alone from Point C, the system head has no static component and will be frictional head only. This is calculated and appears as curve B in Fig. 12.

The system head for Branch A alone from Point C has a 10 ft static head component plus the friction in 500 ft of 4 in. line and works out to be Curve A in Fig. 12. The capacities for the two branches for equal system heads at Point C can then be added together to give the system head of the two branches as a unit which gives us Curve A and B on Fig. 12.

As the friction loss in the piping from the supply to Point C is common to both branches there would be no difficulty in establishing the friction head curve. This appears as Curve D. As Point C is 50 ft above the suction supply, the system head for the common system up to Point C would be the friction head plus 50 ft. Adding to these head values, the head values on Curve (A and B) we get the system head curve for the system, (A and B), on Fig. 12.

If the pump used for this service had the head-capacity characteristic H-Q on Fig. 12, the resulting total flow would have been 358 gpm. Projecting down to Curve (A and B) it will be seen that this capacity would have required a head at Point C of 31 ft. Projecting over to Curves (A and B) will indicate 193 gpm going to Tank A and 165 gpm to Tank B.

If the two branches to the tanks had been equipped with valves actuated by some control so that they close when their respective tanks become full, there would be cases where the flow would be to either one of the tanks. The flow to Tank A, if the branch to Tank B is shut off, can be determined by constructing its system head curve A_s. This is done by adding head values on Curves A and D plus the 50 ft static head and noting where this curve A_s intersects the H-Q curve of the pump.

Likewise B_s can be constructed to show what the flow to Tank B would be if branch to Tank A is shut off. Had it been contemplated to use a pump which developed 61.5 ft or less total head at 90 gpm capacity, the entire flow would have gone to Tank B.

In many cases, especially those involving two or more pumps each with its own piping, valves, and fittings discharging into a common discharge line, the solution of a problem can be simplified. This is done by determining the head each pump will produce for its range in capacity at the point in the system where the piping becomes common.

For example in the system shown diagrammatically in Fig. 13, the usual head capacity of Pump No. 1 is shown on Fig. 14. The friction loss from suction supply to Point C is plotted as curve H_f. The system head Curve $H_f + S$, for Pump No. 1 from the suction supply to Point C is thus determined. Subtracting the values on Curve $H_f + S$ from those on the H-Q curve of the pump, gives Curve H_e indicating the head that will be produced by Pump No. 1 at Point C is dependent upon the capacity being delivered.

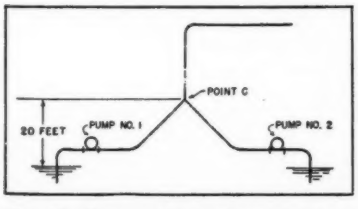

Fig. 13. A pumping problem involving two pumps discharging to a common line. Solution of problem in Fig. 14

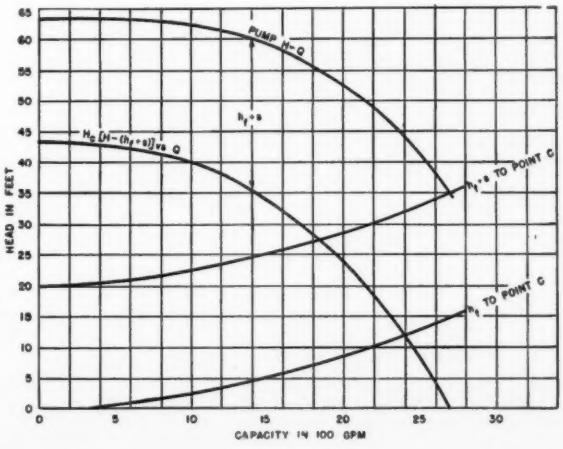

Fig. 14. Problems of common discharge lines as shown by Fig. 13 can be solved by first determining the performance of each pump up to the common point or junction of the two discharge lines

How to Make Various Stub Connections

Here are concise directions on making stub connections in large mush coils and in motors which use pre-formed and pre-insulated coils. Other directions cover the connections for windings which have large conductor cross sections and the use of special clips

By C. GENTILINI, *Engineer, National Electric Coil Co.*

STUB connections are the connections between the individual coils in a group; this differentiates them from the connections which are made between groups of coils. In gang-wound mush coils the stub connections are eliminated entirely, because the group of coils is wound continuously, the conductor progressing from coil to coil without a joint. For the larger mush coils, where single coils are wound, the connection between coils can be made in two different ways.

The ends of the coils to be connected are twisted, then fused together by a gas flame. Or they may be skinned, tinned, twisted together and then soldered. Of course, the fusion type of connection is faster and is the one most commonly used. The insulating of this type of stranding is usually accomplished by employing varnished tubing as shown in Fig. 1. Several servings of bias-cut, varnished cloth tape and cotton tape for Class A coils may be used or mica tape and glass tape may be used for Class B coils. The motors in which this type of winding are used do not exceed 500 v nor are they over 50 hp.

For motors which use pre-formed and pre-insulated coils there are as many different ways of stubbing a winding as there are windings. These can be divided into two broad classifications: Those which have conductors of relatively small cross-sectional area, consisting of one to four small strands in parallel, and those which have large cross-sectional conductors with four or more large strands in parallel.

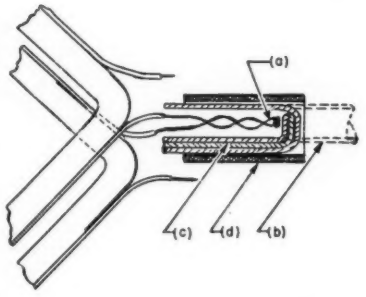

Fig. 1. The insulation of a twisted, fused connection can be accomplished with several pieces of varnished tubing. The inside piece of tubing is bent over on itself and held in place by a larger size which is slipped over it. In the drawing (a) is the twisted and fused joint; (b) is the inside tubing before being folded; (c) the inside tubing after being folded over the joint; and (d) is the outside tubing

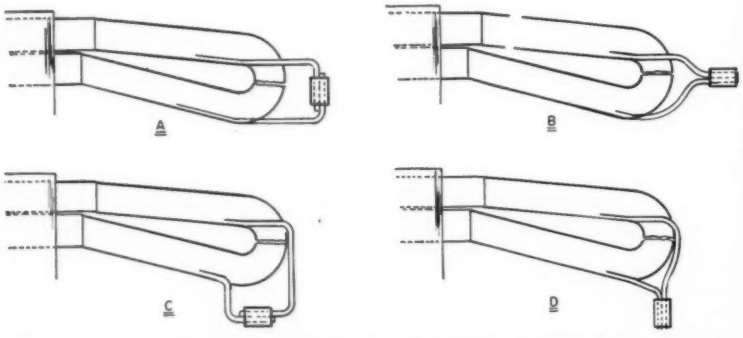

Fig. 2. Here are several suggested methods of bringing out the leads to form stub connections. A and B are used when the room is plentiful; C and D are employed when end room is limited but there is ample space between the end winding and housing

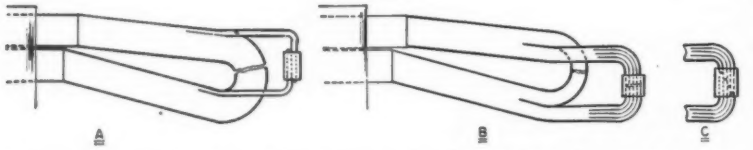

Fig. 3. When the leads are brought out on the side of the coil nearest the gap, stub connections similar to those shown in A can be formed. For coils with large conductor section, a butt joint can be made as shown in B using large, heavy clips to carry full coil current. A special butt-lap-combination joint is shown in C.

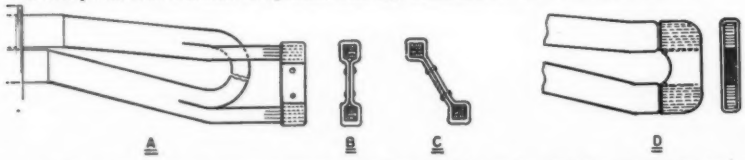

Fig. 4. Here are shown several types of clips used in coils with large conductor cross-section. Types B and C are used for multi-turn, Type D for single or half-turn coils

The leads of the coils are usually lap jointed and the way in which the stubbing is accomplished depends upon the way the leads leave the coils.

In Fig. 2 there are shown several ways of making a stub joint when the section of the lead is not too large. Although the figures show the stubbing for the type of coils where the leads leave the coil at the bottom side, the same type of stub connection would be used for coils which have the leads exiting at the top. An example of this is shown in Fig 3A.

It is to be noted in connection with this type of stubbing that the clip or sleeve serves a mechanical purpose of holding the wires together in addition to an electrical purpose of carrying some of the current. For this reason the clip or sleeve is made mechanically heavy without any particular consideration of current carrying capacity.

For windings which have large cross-sectional area conductors the stub connections are sometimes made with a butt joint, as shown in Fig. 3B and 3C or with a special clip as shown in Fig. 4

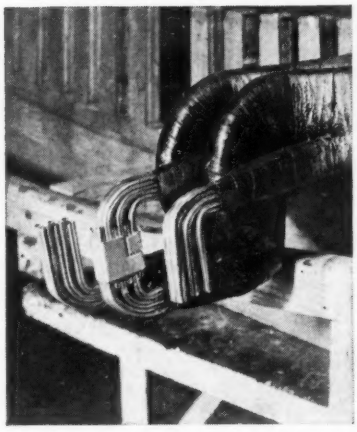

Fig. 5. An excellent lap-type joint can be made for coils with stranded conductors. The photograph pictures details of the joint. Note the simplicity of construction of the joint and that size is sufficient to give ruggedness

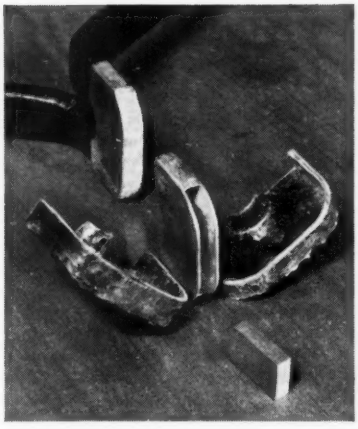

Fig. 6. The type of cap shown in the photograph above, a special molded mica insulation cap, can be adapted for coils using clips like that shown in Fig. 5 A cap of this type is extremely simple to install

Fig. 7. Coils for large generators usually have special strand transposition to decrease eddy current losses. For this type coil, butt joints are made using a series of special clips. Insulation between the series of joints is usually molding mica

It also should be noted here that the clip or sleeve must have sufficient cross section to carry the full coil current and to give it, in addition, sufficient mechanical strength. In Fig. 3B the leads are shown pre-formed, although this bending operation can also be performed during the process of winding. To avoid having a clip or sleeve which is too large and with too great a cross section, the butt joint is sometimes made as shown in Fig. 3C. Here the advantages of using a combination butt and lap joint are obtained. Another excellent type of lap connection is shown in Fig. 5. Shown in Fig. 4 is a stub connection using a special clip. This clip may take several shapes and forms as shown in the sectional drawings 4B and 4C. In Fig. 4B and 4C the space for the leads must be small enough to provide a good tight drive fit if a good, solid connection is to be had. In Fig. 4D this tight fit is assured by driving fillers between the two leads. The type shown in this drawing is less expensive than the preceding two but still makes an excellent joint; it is usually employed for half turn coils.

The insulation of all types of stubs depends upon the voltage and consists of multiple servings of bias cut varnished cloth tape or mica tape, and a final serving of cotton tape or glass tape for Class A or Class B coils respectively. For stub connections, such as shown in Fig. 4D, special molded mica caps can be provided. These are held in place with turns of glass tape. Several servings of mica tape are used at the junction of the coil and the molded mica cap. The tape is protected from windage with glass tape. A typical molded mica cap and the stub for which it was made are shown in Fig. 6.

Coils also are made with special lead transpositions to reduce eddy current losses. An example of one such transposition and how it is connected is shown in Fig. 7. Butt joints, for this type coil, are made by using a series of special clips.

Getting Rid of an Oil Mist

OIL MIST in the screw machine room of the Wolverine Brass Works, Grand Rapids, Michigan, has been completely eliminated by the installation of electrostatic precipitators according to reports received from Westinghouse Electric Corp.

As a result, say the company engineers, the cooling oil recovered by electrostatically precipitating the oil out of the atmosphere and by properly hooding each machine to collect the flying drops will pay for the installation in twelve months.

Together with improved working conditions, additional savings accrue from reduced maintenance—cleaning the floors, ceilings, girders, lighting fixtures, pipes, ducts, columns and the machine.

The operating head of the screw machine is readily accessible to the operator when the machine's hood is up and the side panels are removed.

The How and Why of Steam Trapping

By H. G. EBERT
Yarnall - Waring Co., Philadelphia, Pa.

Part II. Venting air and other gases and venting requirements . . . Dalton's Law of partial pressures . . . Reason why air reduces heating capacity of equipment . . . Cold pockets . . . How air is introduced into the piping system . . . Density of air and steam . . . Manual and automatic venting devices

ALTHOUGH the primary object of the steam trap is the removal of condensate from steam spaces, it also has another very important function, viz: the removal of air or other gases. Traces of various gases such as free carbon dioxide, ammonia, etc., are frequently found in steam generated from inproperly or incompletely treated feedwater, but their quantity is frequently too small to consider in connection with removal through trapping devices. Air, however, is frequently present in considerable volume in steam spaces and its effective removal is vital to the efficient operation of all steam heat transfer equipment.

Air Heavier Than Steam

When steam is first admitted to coils and jackets for the purpose of transferring its heat for some useful effect, the air that filled these spaces must be driven out before this effect can be efficiently accomplished. After this is done, either by means of a steam trap which will also discharge air or by manual operation of vent valves, provision must be made for continuous removal of small quantities of air which may enter with the steam or through some operation of the system. Since air is heavier than steam it tends to settle in low points of heat transfer equipment and thereby prevents steam from reaching such points.

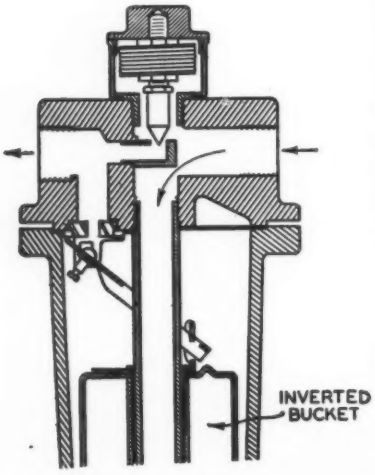

Fig. 9. A thermostatic air vent or internal bypass

This results in cold pockets and not only reduces the surface available for heat transfer but also frequently causes spoilage of the product. The presence of air in considerable quantity *mixed* with steam will cause a marked reduction in steam temperature. The explanation of this phenomenon may be found in Dalton's law which states that *if two or more different gases exist as a mixture in a closed vessel, the total pressure exerted by the mixture on the walls of the vessel will be equal to the sum of the individual pressures exerted by the gases making up the mixture.*

Applied to a mixture of steam and air with a pressure of, say 100 psig, this means that the actual *steam* pressure will be less than 100 psig since the air present in the mixture is also exerting a partial pressure and the sum of the two equal 100 psig. Thus, if 30 per cent volume of the mixture is air, the actual *steam* partial pressure will be approximately 66 psig and it will have a temperature corresponding to this pressure or about 312 F as against 338 F for 100 per cent steam. In normal operation this temperature reduction is not significant to the relatively small amounts of air likely to be encountered but the mixture of air with steam in any considerable quantity will reduce the rate of heat transmission, resulting in slower heating.

Intermittent Cycles

However, the major problem is still the initial removal of the air in the steam spaces and in the case of a heating arrangement in which the cycle is intermittent this removal must be effected at the beginning of each cycle.

Orifice traps will discharge air in considerable quantity without requiring special adjustment or auxiliary vents. Thermostatic traps will discharge air from steam spaces due to the fact that the air will generally be at a lower temperature than that at which the trap is set to close.

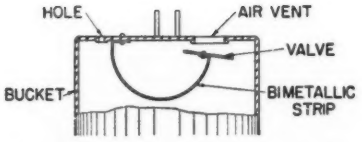

Fig. 10. A bimetallic strip air vent built integral with an inverted bucket

Float traps and open bucket traps can be made to discharge air through a separate auxiliary device, generally in the form of external bleeder or vent valves located at the top of the trap or internal thermostatic bypasses. The latter type is illustrated in Fig. 9. Where manual vents are used they must be tended frequently for traps of this type will air bind and consequently cease functioning if this is not done.

Inverted bucket traps have a very small air discharge capacity unless provided with a thermostatic vent. When this is not provided their air discharge is limited to the amount of air which will pass through the vent hole in the top of the bucket under a static water head not exceeding the depth of the bucket. The actual pressure at the trap has no bearing on this air discharge capacity since it is exerted both above and below the vent hole. An auxiliary thermal air vent may be provided in the top of the bucket as illustrated in Fig. 10 and a substantial air discharge capacity may be obtained.

Impulse traps open wide and discharge air to full valve capacity at pressures up to approximately 15 psig. From 15 to about 30 psig an intermittent air discharge takes place with a gradual reduction from full open capacity at 15 psig to the capacity of the control orifice only at about 30 psig. At higher pressures air will be discharged through the control orifice. The air discharge capacity of an impulse trap is in proportion to the line pressure, increasing with higher pressures.

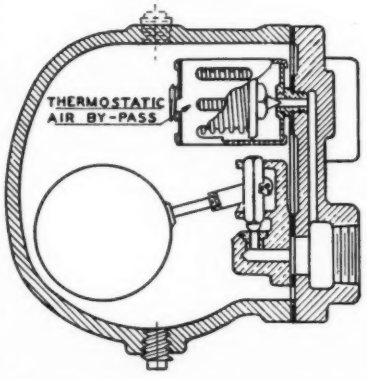

Fig. 11. Another arrangement of a thermostatic air vent on a ball float

Questions and Answers

Question No. 14

Data Wanted on Heat Losses from Uncovered Tanks

I WOULD LIKE a table giving the heat losses by evaporation and also by radiation (to be given as separate figures) as transferred to the atmosphere from the water surfaces of uncovered tanks or vessels, either from water only or solutions containing for the most part, water.

Preferably these losses should be given starting at atmospheric temperatures of 75 or 80 F to and including the 212 F boiling point of water in 10-degree divisions. The losses are to be calculated from atmospheric temperatures of 60 F, assuming still air.

Also, a table giving heat losses at the same water temperatures from metal wall areas of tanks would be appreciated.

I have used a table for some time that presumably gives this information, but from actual experience, it has been found that the heat losses given are much too low, and we have been forced to discontinue the use of this table.

Los Angeles, Calif. C. C. S.

Question No. 15

When to Pour Pier and Base?

I HAVE a machinery setting job to do that has me puzzled as to the best way to go about pouring the concrete base. In the center of this machine there should be a concrete pier. Now what I am puzzled about is whether to pour the base first and let it set part way before pouring the pier or pour the pier first and let the concrete run down to the base in as much as it will and then fill in the rest when that has settled.

Chicago, Ill. W. K.

Question No. 16

Elimination and Prevention of Fungi

IN OUR PLANT we have several medium size cooling towers that are heavily covered with fungi. I would like to know how we can remove this without damage to the surface. Is there some chemical that we could use for this purpose but that would not be corrosive to the pumps and lines that handle the water?

Is there any way that we can prevent this from accumulating after it is once removed? I understand that there is a fungicidal paint on the market. Would this do to paint the fins with in order to stop the growth of fungi?

Copper sulphate mixed in proper proportions with the water would eliminate this difficulty but I am reluctant to use it because of the fact that this water eventually drains into a lake that is stocked with game fish and I have heard that it is harmful to the fish.

Chicago, Ill. P. D. Q.

Question No. 17

How Remove Welding Flux Dust

IN OUR STEEL plant we do practically all the assembly work of the parts with arc welders. The fumes of the flux mixed with the molten metal give off a red dust that settles on everything. When this dust becomes too thick on the windows it obscures the daylight that is a big factor in our lighting scheme and has to be removed by hand with muriatic acid. This is the only method that we have found that will remove the flux dust satisfactorily, but it is slow and expensive. I would like to know if there is any other method or solution that will remove this dust without so much time and effort.

Cicero, Ill. R. W. J.

Answers To

How to Repair a Concrete Floor

Q. O. J. C. says: "The concrete floor in our plant is in very bad shape, and we thought some reader might have a suggestion to make so that we can repair the bad cracks and holes without having to tear up the whole floor."

Preparing Floor for Repairs

THERE ARE many mastic surfacing materials which can be applied over a concrete surface. If the floor is to be subjected to heavy duty traffic, oil conditions or other types of flooring abuses, however, a long-life, durable floor surface of good, hard concrete is advisable. The primary consideration for good, hard concrete is the aggregate used. One material of this type is a balanced aggregate of natural mined emery. This is mixed with cement and water, the same as concrete, and applied to an average depth of ¾ in. over a new or old concrete surface gives a durable, nonskid, non-absorbent floor resistant to temperature changes and moisture conditions.

To successfully apply the material it is necessary to scarify the surface of the bad concrete floor to an average dept of ¾ in. After thoroughly cleaning and soaking, apply the material, very dry and pack by hand tamping, rolling and power floating. Finally, trowel to the desired finish, either rough or smooth.

M. A. MCDANIEL
Sales Manager
Walter Maguire Co., Inc.
New York, N. Y.

Expert Oversees Repair Job—E. W.

SINCE questions and answers are invited, I would like to answer O. J. C.'s question pertaining to repair of concrete floors.

I would both suggest and recommend Stonhard Primer, Resurfacer and Resmix, all manufactured by Stonhard Company, 401 North Broad Street, Philadelphia 8, Pa.

We have had a very favorable experience with the products of this company, which sends its own supervisor to oversee the work as it is done by the customer, at no additional expense. If done according to the instructions of this expert, the job is guaranteed. I am certain this would be the solution to O. J. C.'s problem.

E. W.
Prod. Mgr.
Philadelphia, Pa.

Answer To

High Speed Conveyor Operation

Q. Robert Baker asked why the motor driving the conveyeor behaved in such an erratic manner when the electrician hooked it up. First the belt took off at high speed, that was stopped; then the electrician tried another connection, this resulted in the motor running in reverse rotation but at normal speed; on the third trial hookup proper operation was obtained.

Shunt Field Was in Series Not Parallel

I would like to explain to Robert Baker why his 970 rpm, shunt wound, d-c motor driving a belt conveyor behaved in such an erratic manner after being rewired.

According to Mr. Baker, after the first hookup by the plant electrician, the motor ran at an excessively high rate of speed. After the second hookup, speed was OK, but the direction of rotation backwards. The third trial was successful. Why?

The answer is that on the first try the electrician had the shunt field in series with the armature instead of in parallel with it, causing the motor to operate as a series motor instead

of a shunt motor. It is an inherent property of an unloaded series motor to accelerate to a high enough speed to fly apart or "blow up." Hence, the excessive speed on the first trial. On the second trial, the field was in parallel with the armature, but its polarity was reversed, causing the motor to run backwards. The third trial, of course, was a parallel hookup with correct field polarity.

A technical explanation of why a series motor overspeeds when the load is removed follows:

The speed of an electric motor depends on two variables in the following manner:

$$S = K\left(\frac{E_c}{Q}\right)$$

Where S = speed
E_c = counter or back EMF
Q = flux
k = constant

Applying this equation to an unloaded series motor, as soon as line voltage is applied, the motor begins to accelerate, E_c is low and Q is high. As acceleration continues E_c increases and Q decreases, causing S to increase more and more. As E_c approaches line voltage, Q approaches Zero, causing S to approach infinity. Hence, the undesirability of installing a series motor where no-load condition may prevail.

The same equation and line of reasoning may be applied to show how a compound will run away if the series field is accidentally hooked up in opposition to the shunt field. This hook-up is sometimes used on welding generators and is called a differentially compounded generator.

Tiffin, Ohio — G. M. WIDELL

Answer To

How Prevent Fuses from Blowing

Q. Would it do any harm if I put in two 30 amp fuse links in each of the main board fuses? All machines are protected individually by 30 amp fuses. If I did put in two links, how much would that increase the amperage? Twice or more?—A.H.P.

Doubling Fuses Poor Practice

THE NATIONAL Electric Code does not permit fuses in multiple unless the load exceeds the largest capacity cartridge fuse which is 600 amperes. Doubling up on fuse links is inherently poor practice and should never be resorted to. We assume that the 30 amp main line fuses are the correct size for conductor protection or that the panel has its largest branch circuit capacity rated at 30 amp. In either case doubling up the links outside of being poor practice might become dangerous.

It is necessary that fuse rating shall be such as to protect the smallest conductor connected to it and for rubber covered wire the maximum size for 30 amp fuse would be No. 10 Doubling fuse links in order to increase capacity might cause dangerous overheating in either the wire or the fuse clips. The amperage would not be double for two links in the same cartridge because the heat dissipating capacity of the cartridge is limited and two 30 amp links would carry less than 60 amp depending on ambient temperature, etc.

Boonton Molding Co., Boonton, N. J. — J. F. FALK, Plant Enginer

Machines May Be Fused Too High

WOULD YOU LOAD a horse to his full capacity and then take the load from another horse of the same capacity and load him up with the other horse's load also, and expect the horse to go very far?

Why are all the branch circuit fuses of the 30 amp capacity? I should think each branch circuit would be fused according to the load on that branch. In other words, if the total starting amps on one branch circuit is 10, I see no reason for fusing that branch higher than 10 amps.

This woud prevent knocking out a main fuse, in the case of an overload in one of the branch circuits. However, if the main fuse is too small, which seems to be part of your trouble, a fuse of slightly higher rating than the total starting load should be placed in the main circuit. This will probably require a 60 amp switch. You can purchase various capacity fuses from 30 amp to 60 amp that will fit a 60 amp switch.

Overloading a fuse is dangerous practice. Not only is the fire hazard greater but the fuse might build up heat and if you were to open the box at that time it could blow in your face. Further the switch might be ruined beyond repair and you would really have production troubles.

Adamson United Co., Akron 4, Ohio — RAY FRANCE, Safety Director

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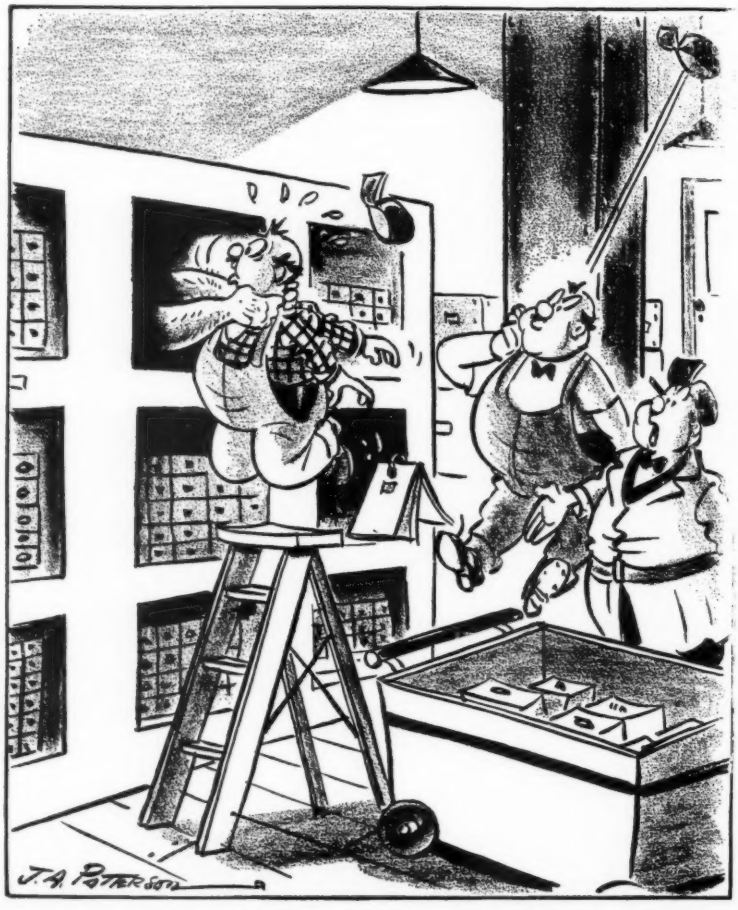
WHILE ELEVATOR cables should be examined thoroughly, particular attention should be made to those sections which pass over the sheaves more frequently. When breaks show in the wires, cables should be watched even more carefully and inspected more frequently.



"You'd be surprised at the number of enemies Gus has working here!"

Answer to No. 4

He's in a Hole and Wants Out

Near Louisville, Ky., B. S. has forty miles of pipe to take out and while he has devised a rig to do it with he sent along a sketch of it and asked for suggestions of other engineers as to improving the rig.

Use Two Slings

I BELIEVE that B. S. can overcome most of his troubles by the following: He should make another sling like Fig. 1 or 2, and attach it rigidly to and about a foot behind the one he now has. The upper bar for pulling would not be necessary on the addition. The above assembly, if ruggedly made, would act as a sort of sleeve which would not cock on the pipe and the rollers would easily ride over the couplings even if pulled in either direction.

Delta-Star Elec. Co. R. A. STERNMAN
Chicago, Ill. Mech. Engineer.

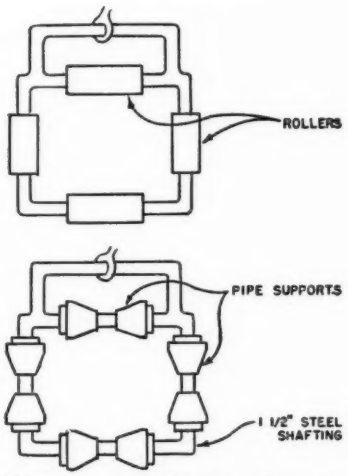


Figure 1, upper drawing, shows the original unit made up to take pipe out of the ground. Lower drawing, Fig. 2 is the unit now in use. Another unit is recommended.

Answer to No. 9

Wanted: "Rope Dope"

For Hoisting Cable

P. C. Z would appreciate hearing from other engineers as to what they use for a rope "dope" or hoisting cable dressing, that is not sticky, heavy-bodied, or opaque. He wants a dressing that will penetrate to the hemp center of the cable, is not affected by average room temperature of 85 F, is transparent and non-drying.

30 Year Old Rope Dope

MAY I SUGGEST the use of a well known dressing called "Cling-Surface" which has been on the market for over thirty years. It is an excellent rope "dope" as desired by P. C. Z. and fulfills his specifications 100 per cent.

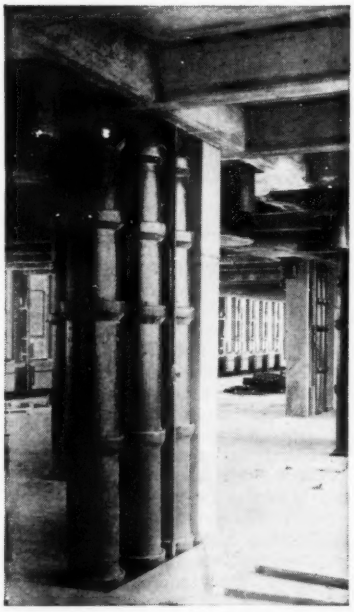
Newark, N. J. W. F. S.

Maintenance and Operation

Clay Exhaust Pipe Ducts

WHEN THE designers of the Murray Hill Laboratory of the Bell Telephone Laboratories laid out the exhaust ducts for the new laboratory they had to put them in what would be inaccessible locations when the building was finished. Since the moisture and perhaps some acid fumes would render metal useless within a comparatively short time the designers specified 12 in. clay pipe. These pipes extend from the basement to the attic floor and are installed in groups of three at 24 ft. intervals. Connections to the hoods from the ducts are made with Carey Duct. Above the attic floor steel pipes, protected on the inside with a corrosion resistant paint, carry the fumes to the exhaust fans. The clay ducts were installed for the general ventilation of the fume hoods and not to handle any particular corrosive agent.

Murray Hill, N. J. F. L. H.

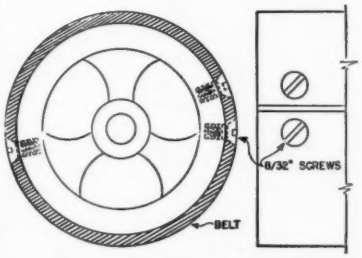


These exhaust air and fume ducts are 12 in. clay pipe. Capacity is approximately 60 cfm per sq ft opening

Improving Pulley-Belt Contact

VERY OFTEN a pulley becomes very smooth on the surface due to constant slipping of the belt and causes a loss of speed and also heating which is transmitted to the bearing. Where the pulley carries a light load or runs at slow speed tightening of the belt may remedy the trouble, provided that the belt is not shortened to a point where it will wear out the bearing. There is an old rule to follow to make sure that the belt is not laced too tight; namely, to join the belt by hand removing all the slack and then take away ⅛ in. for every foot of belting. (This is readily done wiht a piece of cord. For example, if your cord or belt over both pulleys is 8 ft. long, you remove one inch.)

For a number of years I have used a method that did not require a very tight belt. I cover the surface of the pulley with leather belting and secure it with several screws, counter sinking the belt so that the head of the screws are below the surface as in the illustration. In most cases this additional increase in diameter will not require lengthening of belt. Care should be taken on crown pulleys to draw the belt tighter at the ends than at the center, so as to follow the shape of the crown of the pulley.



Covering the pulley with leather belting will increase the belt friction.

New York, N. Y. MORRIS PODELL

Wire Lubrication

THERE ARE two ways to lubricate wiring that will run through conduit in order to make it pull easily. Soapstone or paraffin are of about the same value for lubricating purposes. The principal objection to paraffin is the effect heat has on it.

Care should be exercised when pulling the wire through the conduit that too much strain is not exerted as cases have been reported in which the effective diameter of the conductor has been reduced.

Methods for Repairing Monel Binding and Winding Wires

1. Clean wire with emery cloth an inch on each side of injured spot.

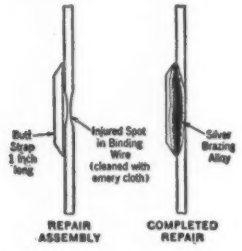

Butt Strap 1 inch long
Injured Spot in Binding Wire (cleaned with emery cloth)
Silver Brazing Alloy
REPAIR ASSEMBLY
COMPLETED REPAIR

Fig. 1. Prevention of break of an injured winding wire on filter drum

2. Cut a one inch long butt strap from a wire of same or slightly smaller diameter and bevel the ends.
3. Lay butt strap alongside cleaned injured spot of wire. Apply silver solder flux such as "Handy Flux."
4. Silver solder with 1/32 in. or 1/16 in. diameter "Easy-Flo Brazing Alloy" wire which flows at 1150 F. Use a very small oxyacetylene flame.

Repair of broken binding wire by this method involves removal of one turn of the binding.

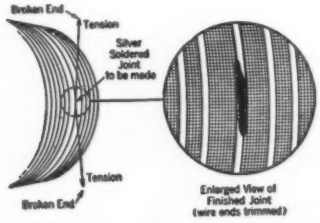


Fig. 2. A broken binding wire to be joined on filter drum

1. Clean wires to be joined with emery cloth for two inches at point of contact.
2. Pull ends of binding wire taut and silver solder wire contact area as recommended above.
1. Clean broken ends with emery

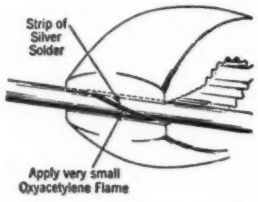


Fig. 3. Joining of broken winding wire (cover removed)

cloth an inch on each side of the break.

2. File a 30 deg bevel on ends to be joined.
3. Silver solder beveled lap joint as shown in illustration. Rewind repaired wire.

International Nickel Co.

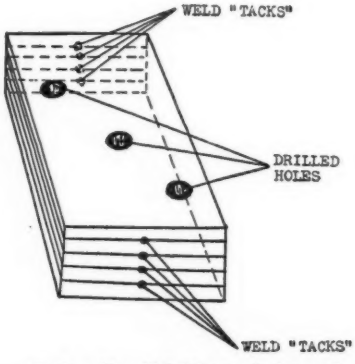
Tackweld Pieces to be Drilled

HERE IS a kink for use when it is desired to hold pieces of metal together. For example, should it be desired to drill identical sets of holes through two or more pieces of metal with the utmost accuracy, use this method.

As shown in the sketch, place the pieces to be drilled on top of each other and then tack them together as indicated, on opposite sides. There will then be no slipping or moving of the pieces with relation to one another as is too often the case where they are held together in the old fashioned manner. Clamps do not always hold work perfectly as every reader knows, and, further, the work is harder to handle when encumbered with clamps.

W. F. S.

Installation of a speed selector which uses planetary motion speed up the threading of pipe on a lathe, it has been reported by one of the largest handlers of threaded pipe in Ohio. Speed range afforded by the selector is from 0 to 800 rpm with 1 hp at maximum speed. Speeds of 20 to 100 rmp are used on this, depending upon diameter of the pipe threaded



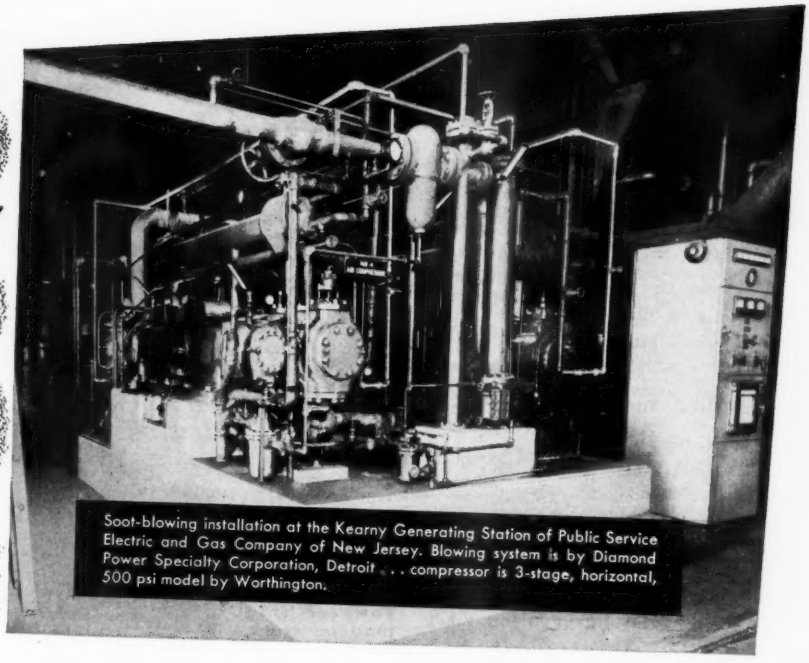
Tack welds will hold several pieces of metal in place while holes are drilled.

A job that saves the Foote-Burt Co., Cleveland, Ohio, time and money. A storage battery-powered, lowlift platform industrial truck moves the job — bench and all — from operation to operation. Nonproductive time expenditure, consumed in "setting up" and "taking down" the item that is in operation, has been practically eliminated

MACHINE POLISHERS available are powered either by air or electric motor. The polisher operates at high speed and generates a certain amount of frictional heat. Unless carefully used there is definite risk of rubbing through the paint film especially on curved areas. For the best results, hold the polisher at a slight angle so that only a part of the pad is in contact with the surface. Keep the machine moving back and forth with overlapping strokes.

Machine polishing requires finer cutting polishes than are commonly used in hand rubbing compounds. When supplied in paste form, the cloth discs should be kept clean. Soak them in clear water, remove, shake vigorously and blow dry with air.

FOR TOP EFFICIENCY IN SOOT BLOWING



Soot-blowing installation at the Kearny Generating Station of Public Service Electric and Gas Company of New Jersey. Blowing system is by Diamond Power Specialty Corporation, Detroit . . . compressor is 3-stage, horizontal, 500 psi model by Worthington.

WORTHINGTON COMPRESSORS MAKE A CLEAN SWEEP

Correct boiler cleaning is yours . . . at a saving in labor . . . when you put an automatic, compressed-air soot-blowing system to work. Compressed air as a cleaning medium offers savings in fuel and savings in feed-water make-up. In addition, the possibility of tube erosion is reduced because condensate is not present in the blowing medium.

SOOT BLOWING AT KEARNY GENERATING STATION

At the Kearny Generating Station of the Public Service Electric and Gas Company, N. J., boiler cleaning became increasingly important, due to a rise in the ash content of the coal. Soot blowing with steam resulted in erosion of the tube surfaces. In addition, the replacement of water removed from the system required chemical treatment and pre-heating.

Compressed-air soot blowing overcame these disadvantages. The Kearny installation operates on an automatic cycle. In the "fog bank" section, four telescopic, long retracting units blow air at about 200 psi over the surface of the tubes, rotating 360 degrees during a projecting and retracting cycle. Short retracting blowers arranged in groups clean the boiler walls and sloping floor.

The booklet, "Worthington Compressors for Soot Blowing" proves *there's more worth in Worthington.* Write for your copy. *Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, New York.*

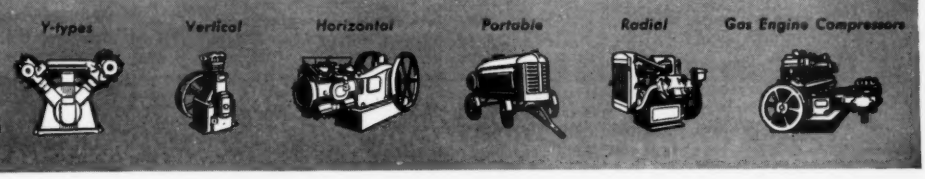
K7.17

ONLY COMPRESSED-AIR SOOT BLOWING GIVES YOU ALL THESE ADVANTAGES

Saves Fuel . . . Saves feed-water make-up . . . Reduces possibility of tube erosion . . . Permits use of lower-cost, low-temperature piping . . . No piping insulation required . . . Reduces soot blower maintenance . . . Dryer blowing medium . . . More effective medium for slag removal.

WORTHINGTON

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON



Plant Engineer's Digest

Battery Maintenance

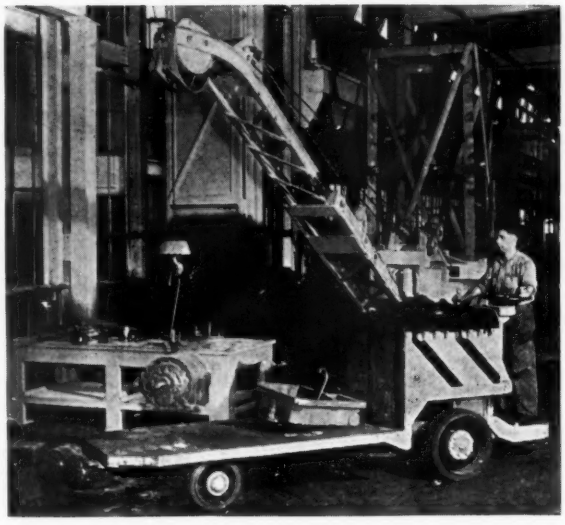
ONLY A FULLY charged battery can deliver proper performance so that batteries should always be kept fully charged. Batteries in storage should be recharged when the gravity reading falls to 1.240.

When installed, the battery should rest level in its cradle with the hold-downs snug. Loose hold-downs allow the battery to bounce in the cradle and possibly damage the elements or cause leaks in the case or sealing compound.

Battery cable connections should be cleaned and the cables themselves be of sufficient length so as to place no strain on the posts and covers. The terminals should be greased. The carriers can be cleaned with a soda and water solution and painted with black tire paint.

The accompanying testing chart relates battery condition to hydrometer readings. Battery hydrometers are adjusted to give correct readings at 80 F. If the battery temperature varies from 80 F, add 4 points of gravity for each 10 degrees above 80, and, subtract 4 points for each 10 degrees below.

A simple but effective demonstration of acid leakage can be made with a regular battery syringe. Pull the hard rubber tip and remove the battery fill caps. Place the open mouth of the bulb over the opening and squeeze gently. The small pressure built up in the battery is sufficient to bring acid bubbling out through cracks in the box or in the sealing compound, and around loose terminal posts. The same pressure will indicate cracked box partitions. *—From The Minuteman, a publication of the Union Oil Co. of Cal., Los Angeles, Cal.*



Co-ordinating the operations of its industrial truck fleet has speeded operations in the Cleveland, Ohio, plant of The Foote - Burt Co., and materially reduced the man - hours and man-power hitherto expended in non - productive operation. In picture (right) battery - powered crane - and - platform truck (background) removes heavy motor from burden - bearing area of battery-powered fixed platform truck, freeing latter for movement to another part of shop with a casting

A battery testing chart relating hydrometer readings to battery condition and cause and remedy of the trouble

Hydrometer Reading	Battery Condition	Cause and Remedy
1.300 or above	Overcharged	Probably caused by high generator charging rate. Overcharging causes high internal heat which may damage grids, separators, and even the case. Buckled plates and short circuits may also result.
1.250 to 1.295	Probably good	No correction, except water service if needed.
1.225 to 1.250	Fair	Advisable to recharge, especially in cold weather. Check operation of voltage regulator and generator. Examine electrical system for short circuits, loose connections, corroded terminals, etc.
	DANGER POINT	
1.225 or below	Poor	Recharge! (See suggestions directly above.)
Cells show more than 25 points variation in reading.	Short circuit in low cell; loss of battery acid by leakage or excessive overcharge; improper addition of acid or dope; natural or premature failure; cracked box partition.	Recommend replacement. Use quick charger to detect defective cell.

Instrument Department Organization

AT THE DOW Chemical Co., Midland, Mich., the Instrument Department is part of the Maintenance Division which includes: the Pipe Shop, Boiler Shop, Electrical Department, the Machine Shop, Paint Shop and others. Practically every type of tool and skill is required. That is why the Maintenance Department is made up of so many divisions, each division specializing in certain fields. To avoid duplication of effort and manpower, the Instrument Department calls upon other maintenance departments to handle certain types of work.

For example, automatic control valve repairs and general piping required for instrument installation and maintenance are handled by the Valve Repair Shop and the Pipe Shop, respectively. The Electrical Department runs conduit, wires instrument panels, and performs all basic electrical work concerned with instrument installation and maintenance.

Selection of instruments for new processes is handled by an instrument engineer. The instrument engineer with flow sheets of the process and such details at hand as the size and capacity of the equipment, proposed ratse of flow, temperatures, pressures, etc., and characteristics of the substances being handled, studies the process from the standpoints of measurement and control and makes recommendations regarding the instruments required. He is aided in his study by frequent conferences with development, design and operating

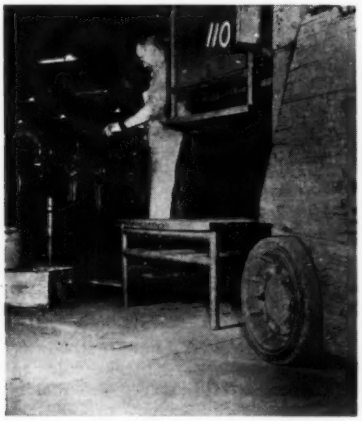
engineers also directly connected with the process. The need for additional instruments for existing processes usually is brought to the attention of the Instrument Department Superintendent by the engineer in charge of the process concerned. The responsibility of knowing available equipment, therefore, rests not only with the instrument engineer, but also with members of the Instrument Department.

Five men report directly to the Instrument Department Superintendent. The men include: an application engineer, a clerk, a shop foreman, and two field foremen

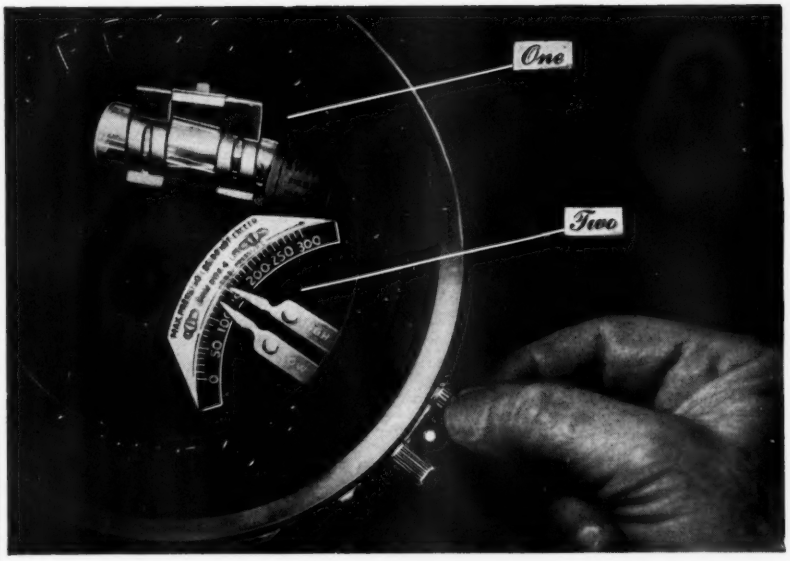
The application engineer is called upon to solve numerous problems which are encountered in applying instruments. The instrument department clerk is responsible for typing records, recording work orders and dispatching trouble calls to field foremen and journeymen instrument men who contact the department office once each hour.

For purposes of instrument installation and maintenance, the Midland plant is divided into two areas. Each area is assigned to a field foreman who supervises the work of an installation crew and a maintenance crew. Each field foreman has approximately six men for installation work and ten men for maintenance activities. The installation crews devote all of their time to new projects. The maintenance crews, when not busily engaged in answering trouble calls, carry on a program of preventive maintenance.

The shop foreman is in charge of six men who make instrument calibration and repairs, as well as two men in the parts and stock room. Each man in the shop specializes on certain types of instruments, the work being



Another adaptation of the storage battery-powered fork truck, at plant of The Bundy Tubing Co., Detroit. Truck places skid-load of cut tubing alongside machine operator. Raised platform enables operator to readily secure supplies without undue manual effort, or waste of time and slowing of operations



There are two things to bear in mind about

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Two *The simple, accurate and positive means of making necessary operating adjustments. No loss of time or annoying guesswork.*

Engineers readily concede the value of these qualifications, due to the relative functional responsibilities involved in automatic controls

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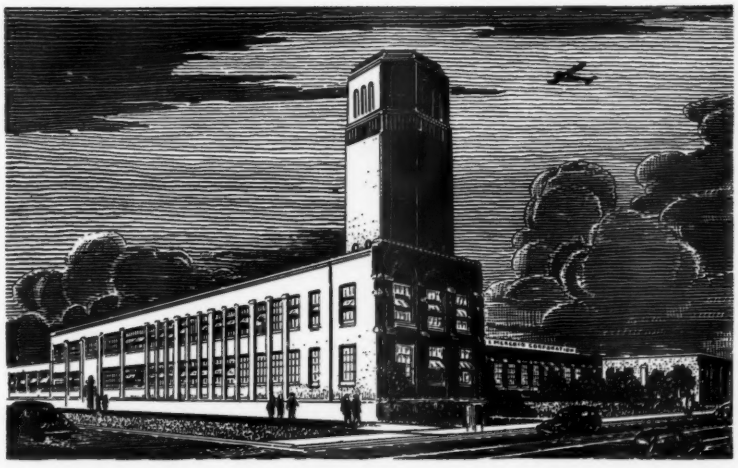

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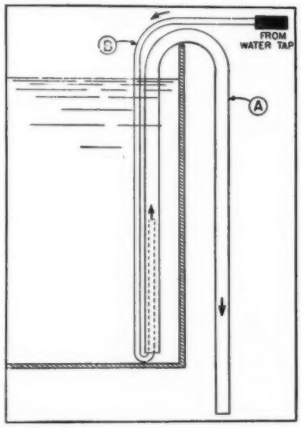
divided into the following categories: (1) thermocouples and pressure type thermometers; (2) electrical meters, potentiometers, and pyrometers; (3) general shop repair work; (4) watchmaking; (5) parts, stock and receiving.

Two pin maps of the plant area are maintained in the instrument department office. These show, at a glance, the number and location of instruments to be maintained and being installed at any given time. These maps accurately portray geographically the layout of the plant and are constantly kept up to date by the instrument department clerk. Pins are placed on the maintenance map, for example, to show where the hundreds of instruments installed in the plant are located. For example, a red pin will represent 20 instruments, a yellow pin will represent 10 instruments and a green pin will represent 5 instruments. A similar scheme is followed as regards the installation map. Here, the colored pins represent the number and location of instruments which are definitely scheduled to be installed.

Dow Chemical Co. realized, as early as 1926, that a subdivision of work and responsibilities in the instrument department was necessary for efficient operation. Aside from those men engaged in supervisory capacities, there are six classifications of workers in the department. In order of increasing responsibility, these classifications are: (1) instrument helper; (2) senior instrument helper — Class 1; (3) senior instrument helper—Class 2; (4) senior instrument helper—Class 3; (5) journeyman instrument man; and (6) instrument technician. *By Rollin H. Briggs, Superintendent of Instrument Department, Dow Chemical Company, in Instrumentation, a magazine published by the Brown Instrument Co.*

Self-Starter Siphon

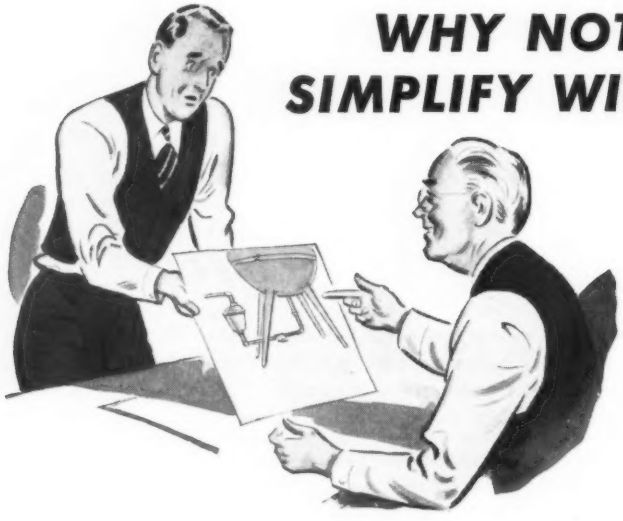
THIS SIPHON is made from a piece of tubing having a diameter of 2 cm or somewhat larger. A calcium chloride tube connected by rubber to two straight pieces of tubing may be used. A piece of 8 mm tubing B is bent in the manner shown and its upturned tip inserted into the bottom of the siphon. This is connected with any convenient water faucet. When the water is turned on in B it will run first into A and then overflow. *William Traeger of The Rockefeller Institute for Medical Research in Science a journal published by the American Association for the Advancement of Science.*



This syphon may be converted to control liquid level within limits by use of a float controlled water valve to start the syphon at the upper level and adjusting the lower end of the tube to break the syphon

New Wrinkle in Infrared Drying

FORCED to consider new methods of drying blankets, the Elite Laundry in Baltimore also discovered the means to faster, more efficient production. They were faced with the spectacle of dozens of blankets hanging for hours on the company drying racks. Acting on a sudden inspiration one of the men took several of the blankets to a local factory where infrared paint making equipment had been installed.



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Of course, there is more to choosing a steam trap than just how many fittings it takes. For instance, long service life, higher capacities, lower initial cost, neater installations—all these advantages and many more are reasons for installing only Super-Silvertop. Can we tell you more?

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and here's how

Super-Silvertop showing one nipple and one union needed.

Conventional trap using seven fittings and two unions.

A trial convinced him that this system could answer his drying problems and he immediately made arrangements to have a special oven installed at the laundry. Employing 216 lamps, the drying oven can process a blanket at a cost of less than 3c, leaving them softer and fluffier than previous air drying methods had. Even more important, shrinkage is practically eliminated.

The dryer has a capacity of 30 blankets an hour and operates for that length of time for a power cost of 79c. Little experience is required to operate the unit and it takes up less than 50 sq. ft. of floor space. Of the 216 infrared lamps in the dryer, 180 draw only 25 w. Tne remaining 36 are rated at 250 w.

To date, well over 10,000 blankets have passed through the dryer. This is thought to be one of the first installed for such application in this country. *From Load, a publication of General Electric Company, Schnectady, N. Y.*

Holding Down Corrosion in Underground Pipes

STRAY currents from the street railway system were one cause of our company becoming conscious of electrolysis problems. In fact, it was necessary to retain a firm of corrosion engineers for a survey of areas where several cases of deterioration of underground pipe mains had taken place. Electrical measurements showed the main was carrying 3,000 amp of current. As a result of these investigations, the company designed and built coating and wrapping devices suitable for protecting all sizes of steel pipe.

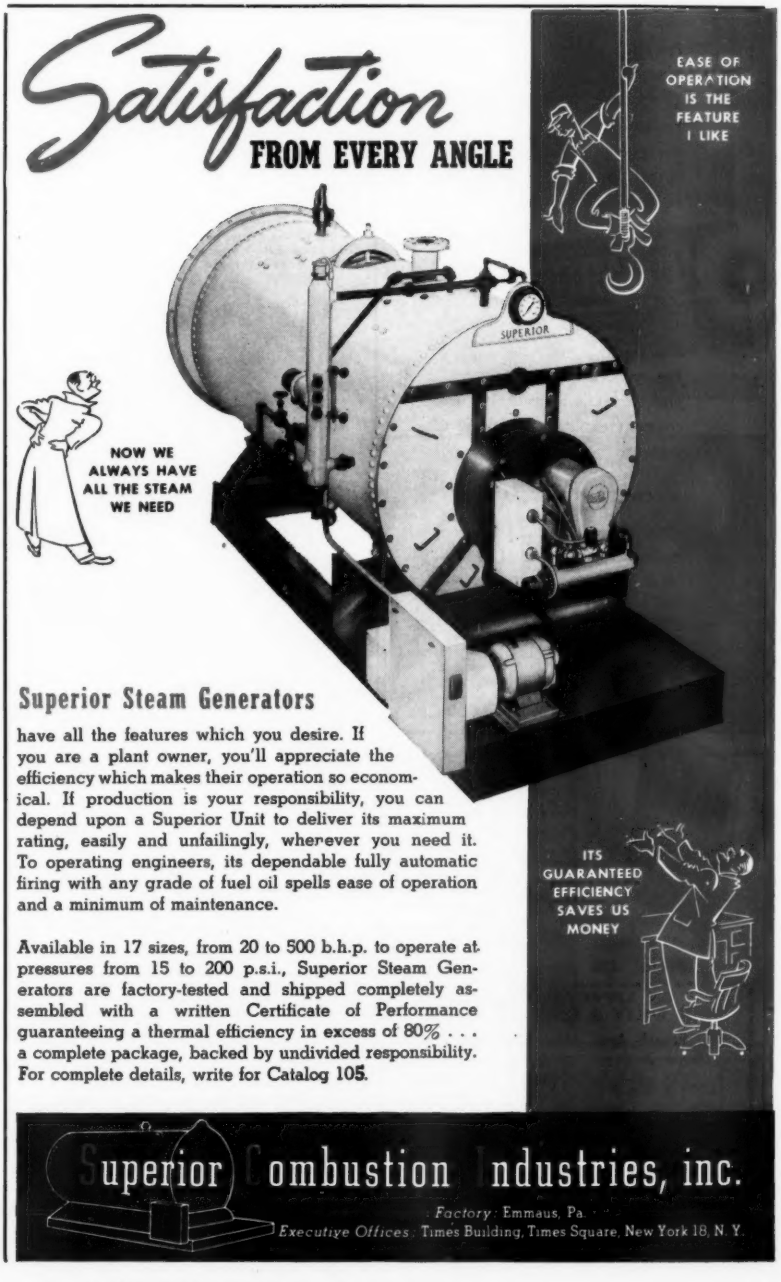
At the present time, at a centralized location, there is an efficient coating and wrapping installation. Here all of the steel pipe used in the district regardless of size, is thoroughly protected by coating and wrapping before installation. The coating and wrapping process consists of: (1) flood coating the pipe surface with a hot wax base coating; (2) wrapping with a dielectric wrapper which consists of a layer of asbestos, a layer of cellulose acetate both strengthened with a backing of tobacco cloth; (3) a second hot wax coating applied over this wrapper as a sealing coat; (4) a wrapping of kraft paper placed over the seal coat to facilitate the handling of the pipe and give visual evidence of mechanical damage.

Preparation of the protected and unprotected parts of the major system is accomplished by the use of couplings. Saran nipples installed with compression couplings are used to separate the major lines from small lateral lines. Coated and wrapped services to large industrial plants are separated from plant piping with insulating flanges at the meter or pressure regulator stations.

Several miles of old unprotected steel pipe were reconditioned and then manually coated and wrapped. The pipe was first cleaned by a portable descaling machine consisting of cutters and wire brushes which revolve around the pipe and loosen the mud and scale.

All major pits in the pipe were then filled by welding. The pipe was then coated and wrapped as follows: (1) apply a fluid wax primer to thoroughly wet the pipe with wax; (2) hand rub a cold semi-fluid wax base coating on the pipe; (3) wrap with a dielectric wrapper; (4) hot flood coat over the wrapper with a solid wax base coating to secure a good field coat. This final coat is "rugged" on. A Pearson fault locator was used in determining points of pipe corrosion. After 3 years' experience with this locator, the following conclusions have been made:

It is a worthwhile and necessary adjunct to other instruments used in pipe corrosion prevention work. It does not replace the conventional type of holiday detector because the proper time to repair coating faults is before the installation of the protected pipe. *By A. H. Cramer, Michigan Consolidated Gas Company, in Corrosion, the official publication of the National Association of Corrosion Engineers.*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New Products and Methods

(Continued from page 12)

Liquid Adhesives

28 Two new modified phenolic liquid adhesives designed for cementing metals, thermosetting plastics, wood, fabric or any combination of these have been announced.

The new bonding agents when properly cured, exhibit high shear and tensile strength and exceptional resistance to water, gasoline, kerosene and mineral oils. The adhesives are especially useful for cementing metals and laminates, for preparing metal faced, sandwich-type construction, for attaching brackets and lugs to thin metal sheets, and for the light vehicular construction found in trailer walls, airplane fuselage walls, and the walls of prefabricated housing. The use of these adhesives eliminates the necessity for sanding plastics. General Electric Co.

Foot Lift Truck

29 The Dual Lift foot pump—a new company feature—helps reduce the foot pressure necessary to lift loads into moving position or maximum height, and thereby eases and accelerates operation of this model. It features an exclusive new hydraulic lift pump development which combines a low

pressure (high speed) cylinder for raising the platform or forks into contact with skid or pallet and a high pressure (low speed) cylinder for raising the load.

Release of pressure on the pedal of the new pump opens the valve that permits the high speed cylinder to idle while the high pressure cylinder is lifting the load. Automatic Transportation Co.

30 A new, self-sealing, no primer, one coat, oil-base, flat wall finish has been announced by the manufacturer. It is suitable for painting over wallpaper, wallboard, kalsomine, tile, brick, wood and rough plaster, and is reputed to combine the easy application features of water paint with the protective advantages of top quality oil paint.

The finish is available in white, ivory, cream, aqua green, ocean green, tulip, rose pink, Holland blue and peach bloom. Other desired colors and personalized shades can be easily achieved by intermixing standard colors. The paint is dirt and dust resistant. It can be washed repeatedly without damage. Harrison Paint & Varnish Co.

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Quick, easy, push-button control featured by Kinnear Motor Operated Rolling Doors gives you a tighter grip on *all* door costs. It helps cut heating and air-conditioning costs through prompt, rapid closing of doors. It saves time and steps (you can have any needed number of additional controls at remote points). It avoids traffic bottlenecks at doorways, and along with these operating advantages, you get the extra durability, protection and space-saving efficiency of these rugged, all-steel doors with their world-famous coiling upward action.

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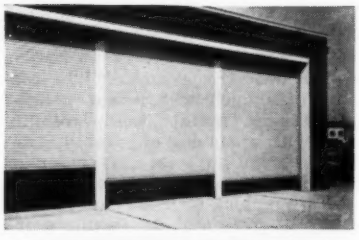

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Fork Truck Shovel

31 Chief among several improvements which feature a new type of fork truck shovel attachment is a pneumatic snubber which minimizes the shock and strain to the upright assembly when the load is discharged. In addition to the snubber, the shovel has 3-point suspension, with a roller cam lock and a single point hook, which permits release of any load with a 15-lb pull.

The shovel is built of ¼-in. steel plate; with a blade 6-in. wide, of specially hardened steel and flame hardened edge. The blade is welded to the bucket. The unit was specially designed for fork truck use in confined areas and for general factory service. It is readily interchangeable with forks and all other attachments mounted directly to the standard fork bars on the company fork trucks. Clark Equipment Co.

Handy Tool Kit

32 A new all-purpose tool kit, which facilitates the installation and repair of industrial equipment and machinery has just been announced.

The kit includes the new electrical impact tool—with standard accessories for nut-running and nut-removal, for drilling steel, masonary or wood, reaming, wire brushing for carbon-cleaning jobs, and equipment for applying and removing studs, tapping, driving and removing screws. The impact tool weighs only 6½

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11

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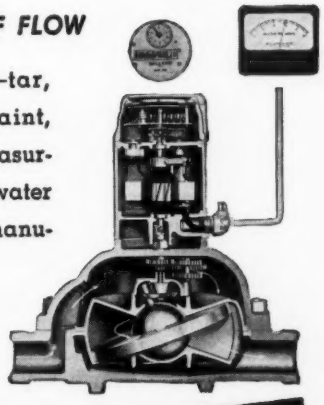

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New Products and Methods

lb, easily performs all of these jobs using standard attachments.

With standard equipment, the kit contains the impact tool with a Jacobs collet type chuck, six hex sockets of varying sizes, a Morse taper socket, and adapter sleeve.

With accessories: twist drills, reamers, taps, carbide-tipped masonry drills, hole saws, screw and stud extractors, wood bits, wire brushes—all in sizes specified. Kit also contains screw drivers and quick change chuck, square Phillips and Reed and Prince bits, together with screw driver adapter for these bits. A universal joint and anvil extensions are available.

The impact tool is the only Universal motor driven, all-purpose tool employing the impact mechanism. It plugs into any ac-dc electric socket and runs as any conventional electric tool till the going gets tough. Then the impact mechanism automatically functions and delivers 1900 rotary impacts per minute to the job. There is no kick, no twist transmitted back to the hand under any condition, and the motor continues to run even when the spindle is stalled. Ingersoll-Rand Co.

Two-Station Inter-Com

33 A two-station inter-communication system that is suitable for installation in homes, professional offices, and other commercial or private applications

The IC-2 System consists of a master unit, one sub-station, and fifty feet of cable sold as a package. Additional cable, to two thousand feet, is available. Two-way conversation can be originated from the master or sub-station. Only the master station is connected to 110-115 v a c or d c, at a cost of a fraction of a penny per day. The system is easy to install and operate. The master unit and sub-station is Underwriters' Approved. Talk-A-Phone Co.

Production Control Device

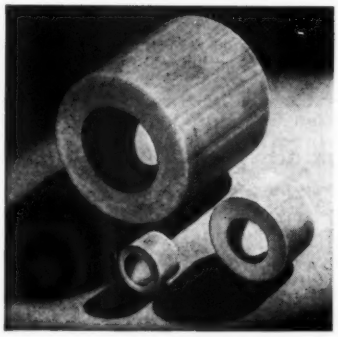
34 Chart-O-Matic consists of a graph chart on rollers, driven by an electric motor. Finger-tip control permits the chart to be rotated in either

direction, at variable speeds; to be stopped at any position. All operating data, such as stock on hand, material on order, incoming supplies, completed units, shipments, etc., is posted on the chart. Then by simply rotating the chart, the entire activities of the plant are shown at a glance. According to the manufacturer, this device gives supervisors an accurate, immediate visual record of work progress, units completed, shipments, absenteeism, etc.; it guides the purchasing department by giving a constant picture of stock on hand, stock on order, parts required, material received; it helps avoid inventory surpluses, averts production delays due to parts shortages. It is further stated that Chart-O-Matic is flexible in application, easily adapted to many operations, has a capacity of 2000 separate items which can be posted in quantities from one to millions. Posting is greatly simplified and speeded up. With a flip of a switch the entire chart listing up to 2000 items can be rotated from one end to the other in approximately 45 sec. Unit is contained in metal cabinet of black crackle enamel with chrome trim, 36½ in. long, 13¾ in. deep, 11 in. high, weighs 84 lbs. It operates on 110 volts, a c. Spiral Mfg. Corp.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11

Valve Packing

35 A chemically inert, anti-adhesive, and easily deformable valve packing is now available. Fabricated from 100 per cent unoriented teflon, the packing is inserted into valve stuffing boxes in the form of a sleeve or bushing and with low nut pressure flows to the

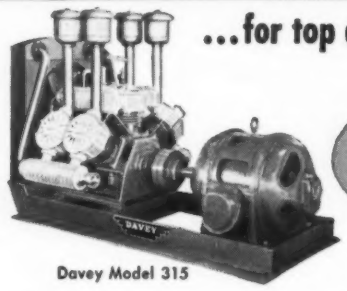


dimensions of the stuffing box. Being chemically inert, the packing does not require replacement. The anti-adhesive characteristics of the material are said to eliminate freezing and binding of valve stems and reciprocating shafts, and minimum operating force is required on the spindle. United States Gasket Co.

Grease and Oil Remover

36 This new product is said to remove grease and oil from concrete, regardless of how deep it has penetrated into the pores. The material is poured on or applied to the surface and brushed in, then rinsed off with water. The entire process takes only a few minutes. The surface is automatically etched ready for painting if this is desired. Results are equally good on walls or floors. Cost of application is between 1c and 2c per sq. ft. A companion product has also been developed and is offered for sale to close the pores of concrete after it has been cleaned, eliminating the possibility of restaining. Applications in garages and machine shops have been made and reported highly successful. Steelcote Mfg. Co.

...for top air output *plus* economy



Davey Model 315

SPECIFY DAVEY DEPARTMENTAL *Compressors*

IN LINE with today's trend toward employment of small departmental compressors instead of one large centralized machine, Davey offers a complete line of industrial units.

These are available in 60, 105, 160, 210 and 315 c.f.m. capacities. And every Davey has GUARANTEED LIFETIME VALVES.

DAVEY COMPRESSOR CO. • KENT, OHIO

DAVEY COMPRESSOR CO. ADVANTAGES

- Power savings
- Lower air losses
- Maximum air operating efficiency
- Make plant expansions easy and economical
- Eliminate shutdowns due to compressor failures
- Air cooling eliminates water bills
- Ease of installation
- Reduced maintenance and replacement expense

Write for Bulletin E-219

DAVEY

P&P-102

DAVEY COMPRESSOR CO. *Dealers in Principal Cities*

Bulletins . . . . Catalogs

Keep posted on current practice, learn what other plant engineers are doing. Know the how and why when the need arises. Mark the bulletins you want by number—or ask questions on specific applications—on the no obligation, no postage, "Mark, Clip and Mail" postcard between pages 10 and 11 and 42 and 43

MAINTENANCE

101 **Balanced Lighting Handbook**—This 12 page booklet utilizes line drawing for an explanation of proper and improper lighting for industrial plants. A text written to give information tells what to consider and why balanced lighting is needed and how to go about obtaining it. It points out the need for spot lighting as well as general lighting. Sketches show where to locate units for best results. Fostoria Pressed Steel Corp.

102 **Industrial Foor Resurfacer**—Three way improvement of industrial floors is explained in this 4 page folder. Installation photos illustrate use of product. The Camp Company.

103 **Floor Enamel**—This leaflet explains how accidents can can be cut through use of the rubber-coat floor enamel. It is shown to dry fast—within one hour—to come in many attractive colors, to be chemical and gasoline resistant and to leave a semi-gloss finish. The various colors are indicated. Wilbur & Williams Co.

104 **Industrial Finishes**—This folder contains a new color selector for a line of industrial maintenance finishes. Shown are color panels for industrial enamels, industrial floor enamels—interior and exterior, wall paints and identification paints. Ojaco Paint Products.

105 **Aluminum Rigid Conduit**—The features of this type conduit are explained in 4-page bulletin. Two tables show the sizes and weights of the conduit and the approximate dimensions of the conduit elbows. Drawings indicate various type elbows. Installation procedures are detailed. Aluminum Co. of Canada, Ltd.

106 **Spray Finishing Systems**—Catalog No. 96 contains 122 pages of valuable information on this line of spray painting and finishing equipment for all applications. Included with the catalog is a new price list. All items are amply described and illustrated and their applications are explained. The booklet is extremely informative and the technical data is arranged in a clear and convenient manner. Included is a series of four nozzle set-up charts and drawings for particular spray systems. There is immediate delivery on nearly all items. Binks Mfg. Co.

107 **Aluminum Paint**—How to use aluminum paints for brighter and cooler interiors; how to get best results on wet walls, on wood, metal, brick, concrete (inside and outside), on heated surfaces, roofs, equipment, products; which specific types of aluminum paint to use, are described in this 24-page manual. Photographs show typical applications of the paint. Aluminum Industries, Inc.

108 **Water Cooler Accessories**—A line of electric water cooler accessories such as: wall fountains and glass fillers are described in this Form No. 319. Photographs illustrate the text and price is listed. A bubbler for modernizing existing coolers is also shown. Ebco Mfg. Co.

109 **Drying Agents**—A line of these drying agents for industry is described in this 4-page bulletin. The various types of agents are explained together with their properties, efficiency and capacity. The applications in refrigerant drying, organic liquids, packaging hygroscopic materials, preparing dehydrated products, telephone cable splices, tank breathers, etc., are fully described. The forms that the agent takes is indicated. Industrial tower dryers are also described, including information on the calculation of tower size, cooling requirements, regeneration and drying of organic liquids. W. A. Hammond Drierite Co.

110 **Floor Grating**—This 8 page bulletin on welded floor grating contains general engineering data on this subject as applied to standard and close spaced grating. Line drawing depicts methods of fastening gratings. A table of safe loads on grated floors is a feature. Application photos show typical uses grating may serve. Kerrigan Iron Works, Inc.

111 **Cool Drinking Water**—Illustrations and descriptions of 7 different models offered by this company. Four models are of the heremetically sealed refrigeration type with three of the conventional open type compressor. Cafeteria, bubbler, and bottled water types available. This 4 page folder also illustrates the outstanding features, such as, pre-cooler system, cooling tank for use with bottle types, brazed water fittings, accessibility, waste bucket. Cordley & Hayes.

112 **Floor Preservative**—A 6 page folder describing the penetrating preservative offered by this company. Folder explains how product penetrates through wood or linoleum and how this process helps preserve floor. Also suitable for first coat on some woods, treating un-glazed tile, dust sealer for concrete, hardwood floors and steps outdoors, preserving windows, frames. Carpenter-Morton Company.

113 **Color Scheme for Piping Identification**—This 4 page folder will be of value to the man who has to set up a color scheme for quick identification of piping. Presents possible color codes to be followed for piping in these services: fire protection, steam, water, compressed air, combustibles and lubricants, and miscellanious. Sizes of lettering are recommended, and a typical application is shown for clarification. Rust-Oleum Corporation.

ELECTRICAL

114 **Voltage Controllers**—Bulletin 547, 12 pages lists the products of this company. All the models available are described with line drawings showing different mountings and dimensions necessary. Motor-driven, oil-cooled, line correctors, regulated and unregulated models, and instantaneous electronic models. Specifications for different models. A full page of line drawings showing connection arrangements. Handy reference for use with voltage controllers. The Superior Electric Co.

115 **Short Circuit Protection**—Bulletin 3100-PRD-192, 8 page, 3 ring punched, describing this firms high voltage protection units. These enclosed, high-voltage combination starters for motors from 2300 to 4600 v are preengineered. Prices of different units are listed depending upon capacity and whether with blade disconnects or circuit breakers. Illustrated to show how the control works. Facts on polarized field frequency synchronous motor control and two full pages explaining how high-interrupting capacity fuses provide short-circuit protection. Electric Machinery Mfg. Company.

116 **Complete Building Wire Manual**—A new 48-page booklet, H-408, on building wire, "Hazard Building Wires", has been issued. Full illustrated, this manual contains complete engineering information on the many types of wire and cable required by the building industry. Full descriptions of and specifications for the various insulations used in building wires are given together with recommendations for their use. Tables showing dimensions and weights of all cable constructions are also included as well as a section devoted to valuable engineering data for added convenience in planning new wiring and rewiring of electrical installations. Photographs of actual cable samples clarify every type of cable construction while the many installations shown illustrate the wide range of uses for Hazard Building Wires. The Okonite Company.

117 **Standby Electric Power**—This interesting, 8 page, Form A-194, folder describes how standby electric power provides protection from electric powerline breakdowns. A table of capacities of emergency plants is included along with a description of the automatic a-c line transfer controls to switch over the electrical load to the standby unit. D. W. Onman & Sons, Inc.

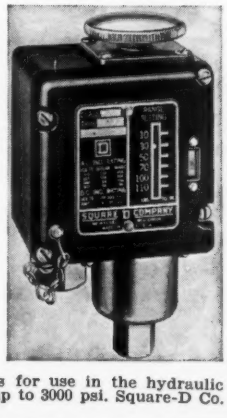
118 **Electric Contact Controller**—Bulletin No. 98098 graphically describes new electric contact controller, indicating or recording, for on-off applications involving temperature, pressure, flow, liquid level or humidity such as ovens, driers, heaters, vats, cookers, tanks, etc. Photographs together with construction and application drawings. Taylor Instrument Companies.

119 **Motor-Generator**—This battery-charging unit for motorized lift trucks is illustrated and described in 6-page Bulletin 206. It is shown to be completely automatic, and to require only 8 to 9 hr for complete recharge. A large scale drawing indicates the many features of this piece of quipment. A table shows the battery type, equipment included, weight, motor hp, power supply and charging time. Electric Products Co.

120 **Small Distribution Transformers**—Bulletin 61B6159A describes and illustrates 100 kva and less transformers made by this firm for pole mounting, substation, or in-

Pressure Switch

37 A new pressure switch, specifically created to meet the needs of the machine tool and welder industries, has been announced. The new switch is designed to cover the wide range and diversified applications encountered in the control of pneumatic or hydraulic machines. Extensive use of these switches is anticipated in the control circuits of welding equipment, machine tools and high pressure lubricating systems.



Positive, quick, make and break action is assured by use of a precision single-pole, double-throw snap switch mechanism. Separated, non-overlapping normally open and normally closed circuits with double-break silver contacts are provided. Bellows-actuated types are available in a variety of ranges up to 100 psi. Piston-actuated controls for use in the hydraulic field are suitable for pressures up to 3000 psi. Square-D Co.

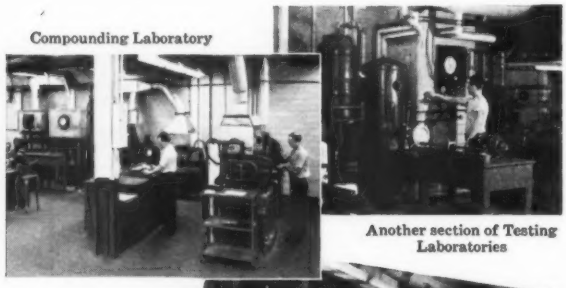
Testing Laboratories general view

Research

Starting in 1887 with the fundamental question—"what makes packing pack?"—Garlock has extended its research from year to year until the newly constructed building shown above is now required to house Garlock's research activities. Garlock products are developed, improved and refined in these completely modern chemical, physical and rubber-compounding laboratories; thoroughly tested in the fully equipped test department and processed in the pilot plant before ever reaching the production department. This *Quality Control* is your assurance of uniformly high quality in every product sold under the Garlock name.

THE GARLOCK PACKING CO., PALMYRA, N.Y.
In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

Compounding Laboratory



Another section of Testing Laboratories

Chemical Laboratory

GARLOCK

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 10 and 11 and 42 and 43

terior plant location. Mechanical data on the various volt classes is listed with dimensions for space and mounting allotments. Connections for low voltage side are given. Prices are listed for various sizes. Allis-Chalmers.

TOOLS

121 **Non-hammer Center Punch**—A 12 page booklet describing this firm's line of center punches and accessories. Punches are offered in five models with different spring pressures and tips. Illustrations and line drawings show methods of use and applications. May be used on precision work, leather, wood, sheet metal. Accessories are Carboloy tipped, hole cutting, chisel, and hammer points, nail set, and self-centering attachment. Models are offered in kits with prices listed. Vinco Products

122 **Powder-actuated Hand Tool**—A 6 page folder describing the models of hand tools made by this company that utilize the exploding fastener, for many kinds of work. Illustrations and step-by-step photos show how the tool is used and how it is constructed. Various uses to which it may be put are listed as: hanging piping systems, attachments to structural steel or concrete, installing air conditioning equipment, plant maintenance. Three powder loads available and different drive pin and stud sizes are listed. Tempo Products Company.

123 **Tools**—Form No. S-2, 15 pages, contains displays of punches and chisels sockets—handles and attachments, pliers, screw drivers, open end wrenches, box wrenches, open end and pipe wrenches, and special purpose tools. Lists of sizes accompany all displays. Also described are a number of soft impact nylon hammers and other suitable maintenance tools. Herbrand Div., Bingham-Herbrand Corp.

INSTRUMENTS, CONTROLS

125 **Graphic Instruments**—This 16-page handbook, entitled Case No. 34X—Solving Industrial Crimes, cities specific instances where various type graphic meters can be used. Innumerable industries are mentioned together with the necessary instrument needed for more efficient operation. Photographs illustrate text. Esterline-Angus Co., Inc.

124 **Thermostatic Water Mixers**—Bulletin 358-H contains information on this line of water mixers that can thermostatically mix hot and cold water and deliver a mixture at any temperature desired. Drawings show complete specifications. The temperature range and capacities are indicated. Price list and shipping weights are given in a table. Powers Regulator Co.

126 **Tachometers**—Direct reading tachoscopes are described with illustrations and a list of the types offered. Explanation of how these instruments may be used to determine the cutting speeds of machines. No stop watch is needed with these instruments. Pocket size, these models may be carried about easily. Improved model can be used for speed indicator, cutmeter, calibration check for tachometers, or a top watch. O. Zernickow Co.

127 **Instruction Manual on Ohmmeter**—Manual 24J25 is for use with this firm's low resistance ohmmeter. Booklet of 47 pages of solid information on how to use the instrument, and how it may be used on equipment to be tested. 21 illustrations; pictures, curve charts, line drawings, tables, showing how the instrument may be applied, how it works, ranges applicable to, and the instrument itself with the power supplies it can use. Formulas for use with various hookup connections, and for figuring corrections for temp. James G. Biddle Co.

128 **Liquid Level Controls**—A 4 page bulletin describing the principle and operation of the relays made by this firm, for application to general purpose pumps, condensate return pumps, deep well cutoffs and pumps, acid pumps, sewage pumps, high and low water cutoff and signals. Pictured with explanations are the induction relays, induction relay switches, relay and starter combinations, multiple pump controls, electrode holders and special controls and panels. B/W Controller Corporation.

129 **Chemical Feeders**—A 12 page bulletin that tells why chemical feeders are necessary and the 2 systems to which they are applied; type S for constant rate intermittant, and type P for proportionating continously. With line drawings the application of the feeder to the different systems is shown. Wet feeders and dry feeders are discussed with attention on equipment needed. Liquid Conditioning Corporation

130 **Fire Alarm Systems**—Reference booklet of 40 pages including suggested electrical specifications for code ringing, pre-signal, master-code, and continuous ringing fire alarm systems. Done in a loose leaf binder booklet contains descriptions of equipment offered by this firm and explains how the fire alarm system is tied into the regular paging system Wiring diagrams are shown for systems. Equipment listed and described is: fire alarm boxes, fire alarm signals, punch and printing recorders. Signals such as bells, horns and whistles, are detailed and the code transmiter operation is explained. The Autocall Company.

131 **Sprinkler Fire Protection**—The effective planning of location of nozzles on sprinkler systems is carried throughout this book, Bulletin No. 64, of 28 pages. Profusely illustrated with line drawings, artist's conceptions, actual applications, and photos of the actual equipment. In most of the application pictures the positioning of the nozzles has been touched up so that the angle can easily be seen. These describe this complete system of fire protction and the components that make up the whole. Proper location of the heat detectors is discussed and shown. "Automatic" Sprinkler Corporation of America.

VALVES, GASKETING

38 **Precision Control Valves**—Catalog No. 17, 48 pages, lists all the valves this firm makes for all pressure ranges up to and including 2500 lb. Illustrated with line drawings, pictures, tables, and curve charts that indicate characteristics, specifications, and applications of the line of valves for both hand and power control. Controls may be had with hydraulic, pneu-

matic, or motor power. Featured is the automatic pressure differential control. R-S Products Corp.

132 **Valve Catalog**—This is the catalog of this maker of valves. Dimension drawings, flange tables, photos of valves, types of controls, cutaway drawings to show operation, make up the illustrations of this catalog. Listed are: slide valves, butterfly valves, threaded and flanged, and automatic and power operated control valves. All the different ways of controling valves by hand are shown. Specifications given for each valve. W. S. Rockwell Company.

MECHANICAL POWER TRANSMISSIONS

133 **Speed Reducers**—Complete engineering data is given on this line of speed reducers in 4-page Bulletin 118. Shown are the dimensions of small type D double reduction unit and the dimensions of large type D double reduction units. The standard dimensions are indicated in inches, and the general specifications are explained. Cleveland Worm & Gear Co.

134 **Flexible Coupling Bulletin**—Typical installation photos show the application of this firm's flexible couplings to a variety of equipment. Dimension drawings, ratings, size listings, and list of applications possible are given. John Waldron Corp.

135 **Functions of Flexible Couplings**—A thorough explanation and analysis is given in this booklet, of 24 pages, to the principles by which couplings operate and their importance in relationship to the equipment it connects. Presents practical helps to plant engineers, mechanics, and maintenance men on how the use of flexible couplings prevents downtime caused by bearing failure, shaft failure and damaged equipment. Description and illustrations show how the operation of a flexible coupling compensates for end thrust and the three types of shaft misalignment. Also describes maintenance of coupling and renewel of wearing surfaces. American Flexible Coupling Company.

BLOWERS, FANS, COMPRESSORS

136 **Low Speed Exhaust Ventilation Fan**—Bulletin 2001, 4 page folder, standard filing size, 3 ring punched, includes illustrations of new ventilating fan offered by this concern. Air delivery tables of entire size line, and dimension drawings are given. Explained is the quiet operation of this fan for industrial plants and offices. Hartzell Propeller Fan Company.

137 **Rotary and Centrifugal Blowers**—Bulletin 120-23-B11, 8 page ,covering foundry cupola blowers of both the Rotary Positive and Centrifugal types. Tables give: the melting rate, with air volume and pressure required, for standard size cupolas; performance data on the sizes and types of blowers recommended for use on foundry cupolas. A brief comparison of the rotary and centrifugal designs. Detail of rotary positive type, with sectional views, features of design, performance curves, and application views. Discussion of centrifugal blowers suited to foundry cupola service with diagrams, performance curves, and installation views. A discussion of the application of air-weight controls to either type of blowers. Roots-Connersville Blower Corp.

FILTERS, DUST COLLECTORS

138 **Air Recovery Handbook**—An engineering and application data book of 16 pages on air recovery equipment used in the conversion of stale or contaminated air. Line drawings, cutaway sections, tables, photos of installations, dimension drawings, possible arrangements, curve charts for capacity and resistance, and specifications of equipment offered make up this book which can be of aid to a plant engineer. W. B. Conner Engineering Corp.

139 **Cooling Systems-Glass Industry**—Innumerable photographs in this 26-page bulletin illustrate various cooling systems in use in the glass industry. The cast aluminum nozzles are shown to be designed for 18 in. center to center spacing and may be connected to air supply located above the furnaces. A typical furnace cooling layout is illustrated with a drawing, as well as the side wall tank blocks. Other drawings show non-overloading furnace cooling air supply blowers and non-overloading mould cooling air supply blowers. Kirk & Blum Mfg. Co.

PUMPS

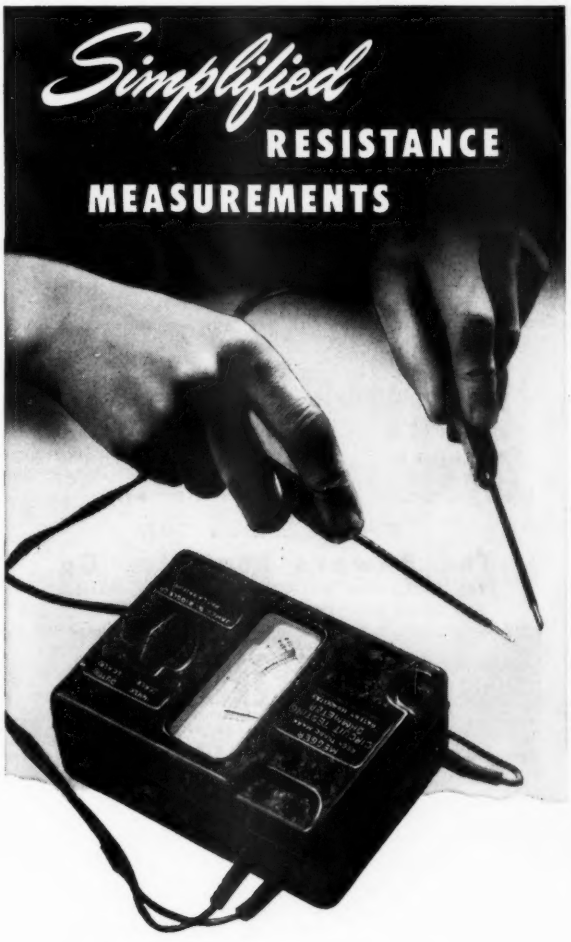
140 **Portable Light Weight Pumps**—Handiness is the feature of the equipment that this bulletin highlights. Centrifugal pumps driven by single cyl gasoline engines are described in 3 different sizes. Cutaway views show operation. Specifications are given. The Gorman-Rupp Company.

141 **Speed Prime Pumps**—In the 12-page Bulletin No. 48-12 the design advancements for these pumps are described in detail and pictured by cutaway and enlarged photos. Included are detailed specifications and helpful application information. This data shows how to figure the right pump for

Paint Scraper

38 An all-purpose paint scraper—said to remove all kinds of paints, lacquers, hard enamels, etc., from both flat and curved wood and metal surfaces with remarkable ease has been announced. Secret of the new scraper is its specially designed, easily adjustable blade which is of Carboloy cemented carbide.

The paint scraper has a specially designed handle in which the blade is held with a set screw. By loosening this set screw, the position of the blade can be changed in the holder to utilize any of the blade's four individually shaped corners or so that the blade will protrude varying amounts to right or left. This makes it easy to get into corners, etc., when scraping paint. If the blade should eventually become dulled by prolonged use, it can be easily and quickly ground on any fine-grained silicon carbide stone or wheel. Red Devil Tools.



MIDGET "Megger"* Circuit Testing Ohmmeters have gained wide favor among engineers and maintenance men for quick, easy circuit measurements . . . for routine tests or for troubleshooting. Similar in size, shape and appearance to the familiar Midget "Megger" Insulation Tester, these instruments are surprisingly accurate and highly dependable. They will meet all needs for quick resistance tests from a fraction of an ohm up to 200,000 ohms. Checks of relays, coils, resistors, wiring, etc. and field tests of many kinds can be made conveniently "on the spot".

The Midget "Megger" Circuit Testing Ohmmeter operates from a 4½-volt flash-light battery. It is a true "Megger" ohmmeter, not just a voltmeter calibrated in ohms—accuracy of readings is INDEPENDENT OF BATTERY VOLTAGE. Each instrument has two scales; a variety of ranges is available.

A few actual measurements of resistance with this instrument yield vital information without risk of injury to apparatus under test.

For further details write for Bulletin 1495-F.

*REG. U. S. PAT. OFF.

JAMES G. BIDDLE CO.

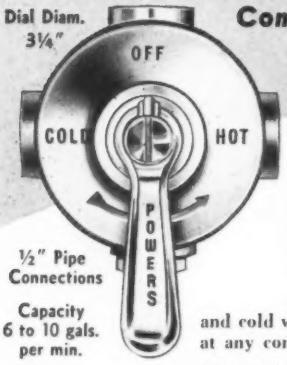
Electrical & Scientific Instruments

1316 ARCH STREET, PHILADELPHIA 7, PA.

THERMOSTATIC WATER MIXER

Dial Diam. 3¼"

Controls Within ½° F.



½" Pipe Connections

Capacity 6 to 10 gals. per min.

•

Other Controls for Capacities up to 10,000 gals. per min.

Most Accurate Mixer Made

Widely used for X-Ray and Color Film developers and other processes requiring exact control; also for shower baths.

Thermostatically mixes hot and cold water and delivers a mixture at any constant temperature required.

Outstanding for its quick acting response to any change in temperature setting or changes in supply line temperatures or pressures.

Write for Bulletin 358-H

The Powers Regulator Co.

2746 GREENVIEW AVENUE, CHICAGO 14, ILLINOIS

Offices in 47 Cities • See your phone book 848

55 Years OF POWERS WATER TEMPERATURE CONTROL

MAKES BASEMENTS DRY!

Leaks in concrete walls can be stopped quickly with FLEXTITE. Actually seals against water pressure. Converts wet basements into dry useful space. Efficient as a plaster coat for sealing off water and dampness. Used in elevator pits, tunnels, dams, tanks, retaining walls. In reconstruction work, broken pillars and beams can be quickly reshaped, with FLEXTITE.

Write For Details of **FREE TRIAL OFFER**

FLEXTITE

FLEXROCK COMPANY

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Canadian Office: 21 King St., E., Toronto, Ont.

Please send me complete FLEXTITE information and details of TRIAL ORDER PLAN — no obligation.

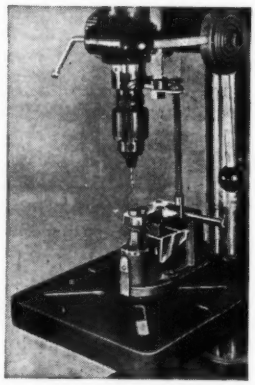
Name .....

Company .....

Address .....

Drill Jig

39 This new jig was designed for shops having cross-drilling operations on a variety of work stock diameters and in a variet of hole sizes on such parts as pins, small shafts, tubing, screws and screw machine parts, etc. It is equally efficient for tool room, experimental department, or the production line.



Cam action is employed to actuate anvil up and down, to and from locking position. The work part is rigidly held with no chance for chattering or slipping, yet a cushion pressure grip assures no marring or scratching.

Also incorporated are features including manual or automatic operation, adjustable side stop for accurate positioning of hole, sturdy semisteel castings, and all wearing parts constructed of heat treated machine steel or tool steel.

Furnished complete with two bushing plates, two double-end anvils, and lock-release rod. Bushing plates accommodate standard slip bushings to 11/32 in. hole size. Double-end anvils take round work stock from ⅛ to ¾ in. diameter. Special anvils for hexagon, square or odd shaped stock Special anvils for hexagon, square or odd shaped made up on request. Manufacturer's Engineering Service.

the job. A sample problem is presented and a mathematical solution is derived. Four tables show water friction in 100 ft of pipe, practical suction lifts for various altitudes, water friction in 90 deg elbows and pressure conversion. Chain Belt Co.

MATERIALS HANDLING

142 **Vibratory Material Handling Equipment**—New, complete 92 page catalog illustrated and describing: electromagnetic vibrators, packers, vibratory feeders, dry feeder machines, weighing feeders, vibrating grizzlies, vibrating lawns, paper joggers, hopper level switches, explosion-proof hydraulically operated feeders, vibrators, jolters, and mechanical shaft seals. Construction and maintenance tools are treated in the same manner and include: self-contained gasoline hammer paving breakers, portable electric hammers, drills, grinders, sanders, electromagnetic form vibrators and flexible shaft mass concrete vibrators. Line drawings are use throughout with application photos to show how the equipment works and where it may be applied. Syntron Company.

143 **Metal Conveyor Belt**—Catalog No. 4 contains 28 pages of valuable information on this line of metal conveyor belts. Their specifications and applications are listed. The various weave constructions are described and illustrated. A full-page of photographs show actual sizes of meshes, openings and meshes. It is further shown how to measure clear openings and mesh per inch. Ways in making a belt endless are explained and illustrated. The various type drives that can be used with the belts are shown in a series of drawings. Innumerable photographs indicate typical installations. The line of drives, sprockets and flight lifts is explained. Three tables list specifications of space cloth, mesh cloth and hardware cloth. Another full page of tables indicate fractional gauges, decimal equivalents and split gauges in decimal sizes. Particulars necessary for installation are shown on a request sheet. Cyclone Fence Div., American Steel & Wire Co.

144 **3-Way Switch**—Bulletin No. 11 shows how packages can be sent three ways with this new switch. It indicates how these packages can be shunted into side aisles without use of deflectors, thus making a conveyor more versatile. E. W. Buschman Co., Inc.

INDUSTRIAL TRUCKS, AUXILIARY EQUIPMENT

145 **Material-Handling Handbook**—This is an excellently designed 56-page practical guide for the analysis of material-handling operations and the application of power industrial trucks. The book is divided into 4 sections dealing respectively with "the place of material handling in industrial management, material handling management, organizing an industrial-truck handling system and practical truck engineering." In the section on material-handling management, the various handling systems are described as well as the cost problems involved and the various handling operations. Discussed in the section dealing with the organization of an industrial-truck handling system are the problems of route analysis, selection of systems, physical plant conditions, keeping cost records, routing and dispatching, etc. The section on practical truck engineering contains information on estimating required number of trucks, tractors, battery capacities, operating costs and other pertinent problems. Tables show mechanical-electrical equivalents, energy calculations, etc. Electric Industrial Truck Association.

146 **Electric Trucks**—This 32-page bulletin first describes and illustrates in detail the operating mechanisms which are basic to all the different type trucks in the line. Each of the seven types are then described and illustrated. Recommended uses, capacity, weight, battery characteristics, speeds, dimensions, electrical characteristics, mechanical characteristics and general characteristics are given. The seven types catalogued are: tilting-fork truck, non-tilting fork truck, low-lift pallet truck, low-lift platform truck, high-lift platform truck, electric tractor and the electric tinplate truck. Different types of rectifiers and motor generator chargers for charging lead or Edison batteries are described. Yale & Towne Mfg. Co.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 10 and 11 and 42 and 43

147 **Tractor Shovel**—This tractor shovel which digs, loads, carries and dumps is described in 4-page bulletin. Photographs show typical operations. A list is included of the various type material that the shovel can handle. Complete specifications are detailed, noting overall measurements, bucket measurements and operation, engine, turning radius, travel speeds, etc. Frank G. Hough Co.

148 **Fork Lift Truck**—This 15,000 lb capacity fork lift truck is described together with complete operating data and photographs. Included is also data on lift, height and weight. Towmotor Corp.

149 **Pallet Systems**—Hand and electrically operated pallet trucks for single and double faced pallets are described in this 16-page Bulletin P476. Photographs show typical operations of the units. Two full pages of pallet designs are included. Palletized carloading is indicated with a series of drawings showing how the cars can be loaded with use of the hand trucks. Barret-Cravens Co.

150 **Materials Handling System**—Within this 24-page Catalog-E are described and illustrated the various units which comprise the physical equipment of the Turner System of materials handling. Shown are series of photographs illustrating various uses of the units in a number of industrial plants. In the description of each item, it is emphasized how floor space is saved through use of the units. Described and illustrated are stacking pallets or skids, storing and stacking transports, portable bin sections, die racks, shop box racks, stacking shop boxes, shelf racks, etc. Factory Service Co.
stacking shop boxes, shelf racks, etc. Factory Service Co.

HOISTS

151 **Hoists**—Complete specifications and prices are included in this 10-page Bulletin 138-E describing a line of hoists. Drawings indicate the specifications. The hoists are shown to include units from 250 to 2000 lb. Chisholm-Moore Hoist Corp.

152 **Steel Hoist**—Bulletin No. 800 contains 4 pages of valuable information on this line of 1000 and 2000 lb hoists. Complete ratings and clearance specifications of the various sections of the hoists are described and illustrated. The motor driven trolleys are amply explained. Robbins & Myers, Inc.

BOILERS, ACCESSORIES

153 **Steam Generators, Package Type**—Four page folder describing the unit offered by this concern. Two series are shown and specifications given for those in 0-250 psi, and 850 psi, with varying capacities from 1500 to 21,000 lb per hr. Folder contains line drawing with dimensions lettered for checking with pressure and capacity table to determine size necessary. Foster Wheeler Corp.

154 **Steam Generators**—These steam generators, especially designed and engineered for general heating and steam processing, are described in 4-page bulletin. A cut-away view shows whirling hot gases passing full length of boiler three times to extract more heat from less fuel. Other photographs show the instrument and control panel and the induced draft fan of the steam generator. A series of illustrations indicate stoker, hand, oil and gas fired methods that can be used in the self-contained portable horizontal return tubular type generator. Other vertical boilers and boiler feed pump and condensate return systems are illustrated and described. C. H. Dutton Co.

155 **Boilers**—A line of "hot steam" boilers is described in this 4-page Circular 127. The illustrations show the fully automatic boiler as it is completely assembled at the factory. The boilers are indicated to run from sizes 2 to 50 hp, gas or oil fired. Also described are a standard and insulated boiler. Alert Engineering Products Co.

156 **Water Tube Boiler**—A horizontal water tube boiler is described in this 8-page bulletin. The general characteristics of this type boiler are listed. The various sections of the unit are explained and illustrated. It is indicated that the boiler has many users because of its large water and steam capacity and because it is a steady steamer. Three views show removable sediment collecting pan arranged over rear water leg and fastened to rear course of boiler drum. Erie City Iron Works.

MISCELLANEOUS

157 **Quick Communication**—This 4 page folder lists the call and communication system offered to save time of busy folks in industrial plants. Music and amplified voice paging for workers may be used. A system for executive and foremen use is also included with the number of stations possible reaching as many as 100. Executone, Inc.

158 **Industrial Heating Units**—Rod type industrial heating units that can be molded to fit for a wide variety of industrial applications are described in this catalog. It is pointed out that it is difficult to cover this item in a circular or catalog, since each particular heating unit is made for a special purpose and varies in shape and wattage. Therefore, each problem requires the special attention of an engineer. Tuttle and Bailey, Inc.

159 **Lubricators and Fittings**—Bulletin No. 16 is this firm's catalog on their sight feed valves, multiple oilers, flow indicators, sight overflows and compression union fittings. Specifications, line drawings, dimensional drawings, equipment photos, a table of losses due to small leaks from minutes to a month is provided. Wm. W. Nugent & Co., Inc., Mfgrs.

160 **Gas Mask Equipment**—As a practical help to all users of gas mask equipment, this series of 5 bulletins presents a wide range of protection equipment for use in hazardous gas and smoke atmosphere. Information is given on the line of full-vision gas masks and canisters, and proper canisters to use for smokes, fumes, mists, organic vapors, acid gases, ammonia, etc., are noted in a table which provides a long list of gases together with equipment recommended. One of the bulletins shows method of determining concentration of gases Acme Protection Equipment Co.

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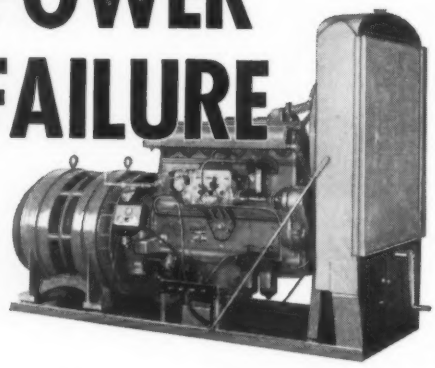

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Plant Engineer's Library

Health in Industry

Industrial Health Engineering by Allen D. Brandt. Size 6 by 8 in.; 394 pages; appendix, bibliography and index; cloth bound. Published by John Wiley and Sons, Inc., New York City. Price $6.00.

The author points out, in the preface, that the plant engineer is much too busy to wade through the masses of data which have been presented in so many publications which touch but lightly on his manifold duties. The book is excellently weighted in all respects but one—the author has relegated the subject plant sanitation and hygiene to the last chapter in the book. In this chapter he covers housekeeping, water supply, eating facilities, wash and locker rooms, toilets and waste. Obviously this is not sufficient space (8 pages) in which to do justice to the subject. Other phases of industrial hygiene, however, have been covered in great detail and the logical development and arrangement of the material increases its usefulness.

The book starts out by describing and listing all industrial atmospheric contaminants and their industrial hygiene significance. An evaluation of these hazards is next outlined and tables of sampling methods are presented. Principles of control and methods employed in this control is a section which states briefly the various types of ventilation and other control methods which the plant engineer or industrial hygienist may elect to use. From here on the various methods are covered in detail. Tables, methods of installation, design of systems, collectors, exhausters and exhaust systems are given. The entire book is well illustrated with drawings and photographs.

Heating and Ventilating

Heating and Ventilating's Engineering Data Book, by Clifford Strock; Size 8½ by 11 in.; 576 pages; illustrated; cloth bound. It is published by The Industrial Press, 148 Lafayette St., New York, 13, N. Y.; price $7.00 postpaid.

The data in this book are organized into ten sections—Heat and Moisture in Air, Fuels and Combustion, Piping, Air Handling and Ventilation, Heating and Heat Transmission, Cooling and Air Conditioning, Motors and Drives, Contract Law, Mathematical Data and Drafting Room Practice, and Terminology.

Purely practical in character, the Engineering Databook is intended for everyday use by heating, ventilating, and air conditioning engineers, contractors, architects, plant engineers, and engineering students. Emphasis is placed on the data needed in actual design with only sufficient text to explain the use of the data.

The Databook is as up-to-minute as possible and includes information on the Heat Pump, Electrothermal Storage, Snow Melting, Heating with Diesel Engines, Solar Water Heating, and Radiant (Panel) Heating.

A most useful and unusual feature of the Engineering Databook is the section devoted to the law of contracts. This section is based on actual higher court decisions which apply specifically to heating. ventilating and air conditioning cases. In this section are discussed: the validity of contracts, implied warranty, technical competence, alteration of plans, extras, sub-contracting, substitutions, inconspicuous clauses, guarantees, distinction between employee and contractor, and many other points covered in the law of contracts. Each case used as an example is one in which a heating, ventilating or air

conditioning contractor or engineer was involved. In addition, other legal subjects which concern heating men are discussed, such as: patent infringement, real estate law, relations with municipalities, mechanic's liens, withdrawals of bids, and "cost plus" contracts.

Industrial Hazards

The Technology of Industrial Fire and Explosion Hazards by R. Cecil Smart. Size 5½ by 9 in.; two volumes; 386 pages; illustrated; an index to each volume; cloth bound. Published by Chapman & Hall, Ltd., 37 Essex St., W. C. 2, London, England. Price 16s or approximately $2.14 for each book.

The serious crisis now being faced by England has forced her to examine every possible means of removing strain from her national economy. The burden of fire losses, which has reached the proportions of $130,000,000 per year, has to be lightened in the interest of national efficiency. These two volumes highlight the gravity of the situation (in the first volume) and call attention to hazards of specific types of materials and installations.

Fire hazards with agricultural products, coal and industrial fuels and gases and subterranean fires are well discussed and means of eliminating these hazards are pointed out by indirection. The books are not primarily books of "action." They point out mistakes as shown by case histories but they do not cover corrective measures.

The second volume deals with the more hazardous materials, new techniques and processes, synthetic materials, toxic gases and electrical fires and explosions. As compendums of the inflammable and explosive properties of materials the books are good; if you want something which will tell you how to prevent fires or how to fight them, look elsewhere.

Practical Book For Industrial Firemen

Boiler Fireman's Handbook, by Joseph R. Darnell, First edition, 189 pages, 9 by 6 inches, 139 illustrations, including photos, drawings, and charts, bound in imitation leather. Published by Technical Publishing Company, 53 W. Jackson Blvd., Chicago, Ill. Price $3.00.

This practical book was written especially for the man in the smaller plant to help him understand the principles and practical application of combustion and the auxiliary equipment pertinent to the problem of generating heat and steam.

The author gives understandable explanations of the components that produce good combustion and their proper relation. He tells exactly how to sample, interpret, and measure flue gas and temperatures.

Methods and precautions of handling coal and preparing it for use are detailed. The calculation of boiler efficiency is shown with curves and tables for handy use.

The effect of preheated air is gone into with a discussion of the various types of preheaters. Draft is explained from the fundamental principles to the practical applications of various machines. Measurement, and the instruments for measuring draft, are discussed with the troubles that may arise.

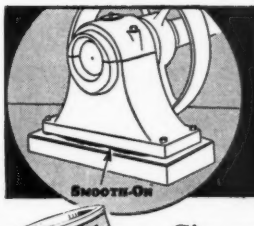
A considerable proportion is given to complete discussion of the different types of firing equipment for boilers, furnaces, and ovens. Hand, and all the differen' mechanical firing devices with all their ramifications and varying effects on combustion and the design of plants are gone into deeply.

Oil firing by both steam and mechanical atomization with principles and practical applications to be considered are developed. Gas firing is treated in the same manner.

Pulverized fuel and waste fuel firing are discussed with latest methods detailed.

Feedwater heating is explained with discussion of the types of heaters and proper locations and the maintenance of economizers with data to help figure fuel savings.

The desirability of incorporating flexibility into firing equipment and furnaces is presented and explained.



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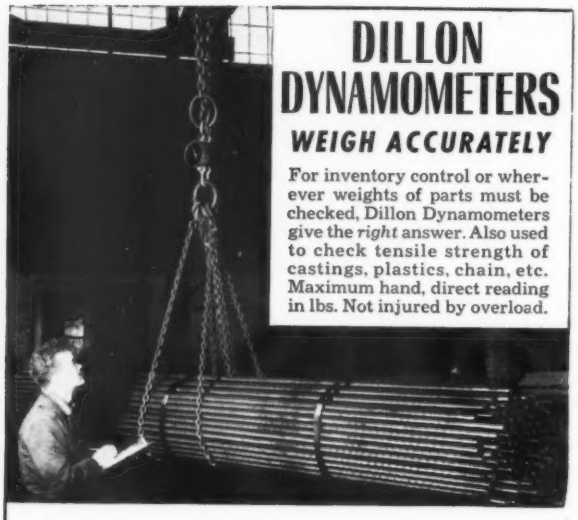

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ADVERTISERS' INDEX

Anderson Co., The V. D. 38
Anti-Corrosive Metal Products Co., Inc. ..... *
Armstrong Machine Works 3

Beaver Pipe Tools ..... Inside Front Cover
Biddle Co., James G. 45
Buschman Co., Inc., The E. W. ..... *

Cash Company, A. W. ..... *
Chadsey Mfg. Co., Inc., G. R. ..... *
Chicago Metal Hose Corporation 7
Cochrane Corporation ..... *
Cook's Sons, Inc., Adam ..... *
Crocker Wheeler Elec. Mfg. Co. ..... *

Dart Mfg. Co., E. M. ..... *
Davey Compressor Co. 42
Dillon & Co., Inc., N. C. 50
duMont Corporation, The 41

Economy Pumps, Inc. ..... *

Flexrock Company 46, 48

Garlock Packing Co., The 44
General Electric Company 8, 9

Hays Corporation, The 41

International Nickel Co., Inc., The 13

Jeffrey Mfg. Co., The ..... Back Cover

Kinnear Mfg. Co. 40
Kirk & Blum Mfg. Co., The ..... Inside Back Cover
Klipfel Mfg. Co. ..... *

Leslie Company ..... *
Liquidometer Corp., The 50

Mercoid Corporation, The 37

Niagara Blower Company ..... *

Powers Regulator Co., The 46, 49

Smooth-On Mfg. Co. 49
Spartan Tool Company ..... *
Speco, Inc. ..... *
Superior Combustion Industries, Inc. 39

Treasury Department ..... *

United States Motors Corp. 48

Waldron Corp., John ..... *
Ware Brothers 47
Wiley & Sons, Inc., John 40
Worthington Pump & Machy. Corp. 35

Yarnall-Waring Company 14

Zurn Mfg. Co., A. J. 5

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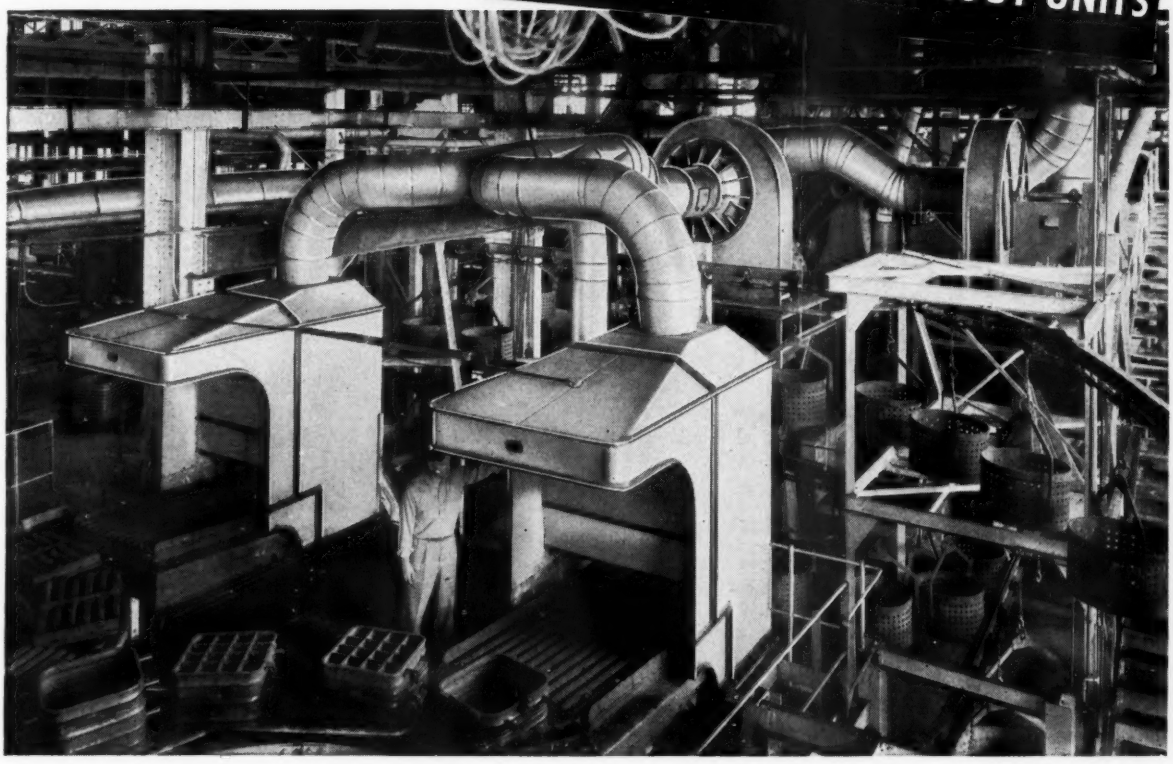

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